Liebert® InteleCool®2

User Manual - Outdoor Wall-Mount Air Conditioner, 2 - 5 Tons, 50 & 60 Hz

EMERSON™
Network Power

TABLE OF CONTENTS

IMPORTANT SAFETY INSTRUCTIONS 1

1.0 INTRODUCTION 3

1.1 General 3

1.2 Standard Features 3

1.3 Optional Features 4

1.3.1 Refrigeration System Options 5

1.4 Ancillary Components 5

1.5 Accessories 5

2.0 INSTALLATION 6

2.1 Preparation 6

2.1.1 Room Preparation 6

2.1.2 Location Considerations 6

2.1.3 Equipment Inspection 6

2.2 Unit Installation 6

2.3 Piping Connections 8

2.4 Ducting 8

2.5 Electrical Connections 8

2.5.1 Power Connections 8

2.5.2 Control Connections 9

2.6 Outside Air Damper—Optional 10

2.7 Economizer - Optional 10

3.0 CHECKLIST FOR COMPLETE INSTALLATION 11

4.0 STARTUP PROCEDURE 12

5.0 OPERATION 13

5.1 Compressorized Cooling 13

5.2 Economizer Cooling—Optional 14

5.2.1 Enthalpy Sensor 14

5.2.2 Actuator 14

5.3 Heating—Optional 14

5.4 Unit Controls 15

5.4.1 Remote Control Interface 15

5.4.2 High Pressure (Standard) 15

5.4.3 Refrigeration Control Options 15

5.4.4 Anti-Short Cycle Timer—Standard 16

5.4.5 Heater Protection—With Optional Heat 16

5.4.6 Lockout Relay—Optional 16

5.4.7 Common Alarm—Optional 16

6.0 MAINTENANCE 17

6.1 Filters 17

6.2 Blower Package 17
6.3 Economizer—Optional 17
6.4 Heat 17
6.5 Refrigeration System 17
6.5.1 Refrigerant Lines 18
6.5.2 Discharge Pressure 18
6.5.3 Thermostatic Expansion Valve 18
6.5.4 Air-Cooled Condenser 18
6.6 Compressor 18
6.6.1 Compressor Replacement 20
7.0 SPECIFICATIONS 22
7.1 Dimensional Data 22
7.2 Technical Data 23
8.0 TROUBLESHOOTING 34
9.0 MAINTENANCE INSPECTION CHECKLIST 35
10.0 PARTS 36

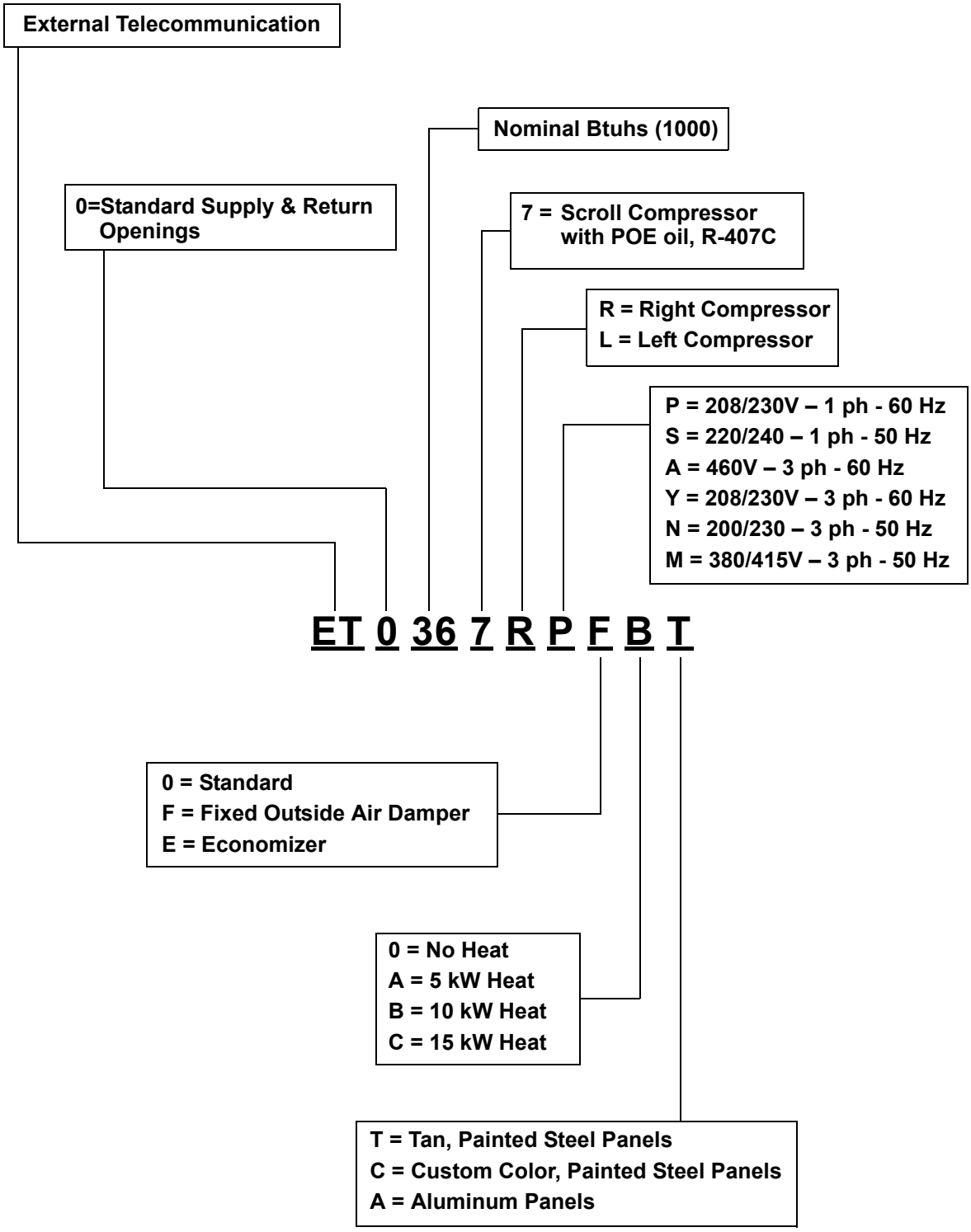
FIGURES

Figure i Model number designation iv
Figure 1 Unit mounting dimensions 7
Figure 2 Low-volt wiring terminals 9
Figure 3 Mounting minimum position potentiometer on actuator 10
Figure 4 Refrigeration system 13
Figure 5 Enthalpy control setting 14
Figure 6 Dimensional data 22
Figure 7 Condenser/piping assembly 48
Figure 8 Evaporator blower 49
Figure 9 Evaporator coil and expansion valve 49
Figure 10 Electric panels 50
Figure 11 Heater assembly 51
Figure 12 Economizer assembly 52
Figure 13 Common alarm assembly 52
Figure 14 Soft start device 53

TABLES

Table 1 Mounting dimensions 7
Table 2 Operating modes/contact closures 15
Table 3 Recommended applications for control options 15
Table 4 Pressure information 21
Table 5 Liebert InteleCool2 dimensions, in. (mm) 22
Table 6 Technical data, 60 Hz - Standard ambient condenser 23
Table 7 Technical data, 60 Hz - Standard ambient condenser, continued 24
Table 8 Technical data, 50 Hz - Standard ambient condenser 25
Table 9 Technical data, 50 Hz - Standard ambient condenser, continued 26
Table 10 Technical data, 60 Hz - High ambient condenser 27
Table 11 Technical data, 60 Hz - High ambient condenser, continued 28
Table 12 Technical data, 50 Hz - High ambient condenser 29
Table 13 Technical data, 50 Hz - High ambient condenser, continued 30
Table 14 Optional heater capacity, 60 Hz 31
Table 15 Optional heater capacity, 50 Hz 32
Table 16 Electrical data, 60 Hz - amps 33
Table 17 Electrical data, 50 Hz - amps 33
Table 18 Troubleshooting guide 34
Table 19 Refrigeration system parts, 1.5 and 2 ton units 36
Table 20 Refrigeration system parts, 3 ton units 37
Table 21 Refrigeration system parts, 4-ton units 38
Table 22 Refrigeration system parts, 5-ton units 39
Table 23 Electric panel, 1.5- and 2-ton units 40
Table 24 Electric panel parts, 3-ton units 41
Table 25 Electric panel parts, 4-ton unit 42
Table 26 Electric panel parts, 5-ton unit 43
Table 27 Motor parts, heater, Economizer, 1.5- and 2-ton units 44
Table 28 Motor parts, heater, Economizer, 3-ton units 45
Table 29 Motor parts, heater, Economizer, 4-ton units 46
Table 30 Motor parts, heater, Economizer, 5-ton units 47

Figure i Model number designation


External Telecommunication
Nominal Btuhs (1000)
0=Standard Supply & Return Openings
7 = Scroll Compressor with POE oil, R-407C
R = Right Compressor
L = Left Compressor
P = 208/230V – 1 ph - 60 Hz
S = 220/240 – 1 ph - 50 Hz
A = 460V – 3 ph - 60 Hz
Y = 208/230V – 3 ph - 60 Hz
N = 200/230 – 3 ph - 50 Hz
M = 380/415V – 3 ph - 50 Hz
ET 0 36 7 R P F B T
0 = Standard
F = Fixed Outside Air Damper
E = Economizer
0 = No Heat
A = 5 kW Heat
B = 10 kW Heat
C = 15 kW Heat
T = Tan, Painted Steel Panels
C = Custom Color, Painted Steel Panels
A = Aluminum Panels

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Liebert InteleCool2. Read this manual thoroughly before attempting to install or operate this unit.

Only qualified personnel should move, install or service this equipment. Adhere to all warnings, cautions and installation, operating and safety instructions on the unit and in this manual. Follow all operating and user instructions.

WARNING

Arc flash and electric shock hazard. Open all local and remote electric power disconnect switches, verify that power is Off with a voltmeter and wear appropriate personal protective equipment per NFPA 70E before working within the electrical control enclosure. Failure to comply can cause injury or death.

Customer must provide earth ground to unit, per NEC, CEC and local codes as applicable.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

The microprocessor control does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "Unit Off" mode of control.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high-voltage.

The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Follow all national, state and local codes.

WARNING

Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and gases under high pressure. Relieve pressure before working with piping.

WARNING

Risk of refrigerant system rupture or explosion. Can cause equipment damage, injury or death.

Do not install a shutoff valve between the compressor and the field-installed pressure relief valve.

For systems requiring EU CE compliance (50Hz), the system installer must provide and install a discharge pressure relief valve rated for a maximum of 650psig (45bar) in the high side refrigerant circuit. The pressure relief valve must be CE-certified to the EU Pressure Equipment Directive by an EU "Notified Body."

WARNING

Risk of improper moving. Can cause equipment damage, injury or death.

Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. Shipping weights and unit weights are listed in **Tables 6-13**.

WARNING

Risk of contact with high-speed rotating fan blades. Can cause injury or death.

Disconnect all local and remote electric power supplies and verify that the fan blades have stopped rotating before working in the unit.

Do not operate unit with any or all cabinet panels removed.

CAUTION

Risk of sharp edges, splinters, and exposed fasteners. Can cause injury.

Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move the unit, lift it, remove packaging or prepare the unit for installation.

CAUTION

Risk of contact with hot surfaces. Can cause injury.

The compressors, fan motors, refrigerant discharge lines and reheats are extremely hot during unit operation. Allow sufficient time for them to cool before working within the unit cabinet. Use extreme caution and wear protective gloves and arm protection when working on or near hot compressors, fan motors, discharge lines and reheats.

NOTICE

Risk of clogged or leaking drain lines. Can cause equipment and building damage.

This unit requires a water drain connection. Drain lines must be inspected regularly and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

Emerson recommends installing monitored leak detection equipment for the unit and supply lines.

1.0 INTRODUCTION

1.1 General

The Liebert InteleCool2 Thermal Management unit was designed for convenience and dependability in unmanned and remote locations typical of the telecommunications industry. Ease of installation, operation and service coupled with the use of high quality, high reliability components make the Liebert InteleCool2 ideally suited for maintaining an environment for sensitive electronic equipment. Standard units are NRTL-C listed/certified to meet U.S. and Canadian safety standards, and MEA listed for New York City applications. These agency listings ensure fast, hassle-free inspection and building code approvals.

Self-Contained

The Liebert InteleCool2 product is completely self-contained. All components are enclosed in the weatherproof cabinet.

Space Savings

The Liebert InteleCool2 does not use any of the valuable floor space inside the secure space. Instead, it is mounted on the outside wall. No additional space is required outside or on a roof.

Easy to Install

The Liebert InteleCool2 is assembled, wired, piped, charged with refrigerant and factory-tested as a system to ensure trouble-free installation and startup.

1.2 Standard Features

Scroll Compressor

The quiet and efficient scroll compressor features a suction gas cooled motor, internal centrifugal oil pump, vibration isolating mountings and internal thermal overloads.

Refrigeration System

The refrigeration circuit includes a liquid line filter drier, an externally equalized expansion valve, and a high-pressure switch. The system is charged with R-407C refrigerant at the factory.

Evaporator Coil

The evaporator coil is constructed of mechanically expanded copper tubes in enhanced surface aluminum fins. A coated, galvanized steel condensate drain pan is provided.

Condenser Coil

The air-cooled condenser coil is constructed of mechanically expanded copper tubes in enhanced surface aluminum fins. Components rated for up to 105°F (40.6°C) ambient.

Evaporator Blower

Evaporator air is supplied by a direct drive blower package. Fans are centrifugal, double width, double inlet.

Filter

The filter is 2" deep, pleated, MERV 7 efficiency based on ASHRAE standard 52.2 (20% based on ASHRAE standard 52.1). Located within the cabinet, the filter is serviceable from the front of the unit.

Cabinet

The exterior cabinet is constructed of painted steel. Internal structural parts (including base) are hot dipped galvanized steel. The evaporator compartment is insulated with 1/2" thick, 2 lb. density, neoprene-faced, fiberglass insulation.

Control Interface

The unit is supplied with customary HVAC wiring designations (R, G, W, Y) inside the low-voltage partition of the unit electric box. The control interface can be provided by sources ranging from a wall mounted thermostat, a Liebert control and monitoring system or a third party building management control.

1.3 Optional Features

Compressor Location

The standard compressor location is on the right when viewing the unit when it is mounted on the wall. The optional compressor location is on the left, to improve serviceability of the compressor when the unit is installed as one unit of a pair.

Compressor Crankcase Heater

An optional compressor crankcase heater is available for use with the scroll compressor, but it is not required because the refrigerant charge of the Liebert InteleCool2 unit with scroll compressor is less than the compressor critical charge.

High Ambient Condenser

This option is provided for applications where the ambient temperature exceeds the normal design capabilities of the units. It consists of a condenser motor and fan blades that are sized to provide additional airflow across the condenser coil. Designed for applications up to 110°F (43°C) ambient.

Heat

Heat is provided in a single stage from an open wire electric resistance element. Heating capacity options available are 5kW, 10kW and 15kW depending on unit model size.

Economizer

The Economizer allows outside air to be introduced to the space through the evaporator filter when conditions are favorable for Economizer cooling. It contains a modulating damper, spring return direct drive actuator, enthalpy control for switchover, outside air hood and a mixed air controller set at 55°F (12.8°C). Mechanical cooling and Economizer operation do not operate simultaneously.

Fresh Air Damper

Allows outside air to be brought in to meet indoor air requirements. Air is drawn in through the evaporator filter. The amount of air to be introduced to the space is field-selectable.

Panel Colors

Optional color choices for the steel panels are almond (light tan, the color option for the original Liebert InteleCool), desert brown, or bright white.

Lockout Relay

The lockout relay latches the detection of a high-pressure condition in the refrigeration circuit and prohibits operation of the compressor until the abnormal pressure conditions are acknowledged. The lockout relay is reset by cycling the unit main power or by changing the setpoint on the thermostat to temporarily eliminate a call for cooling. A normally open set of contacts is provided to Terminals 2 and 3 of the customer terminal strip for monitoring the status of the lock-out relay when this option is supplied without the Common Alarm option.

Common Alarm

The common alarm provides the necessary components to detect high pressure, low pressure, high temperature or loss of indoor airflow, and to provide a customer signal via a contact closure. To detect low pressure, the optional low pressure switch with bypass, T-pack1 or T-pack2, must also be selected.

Soft Start

Provides a PTC resistor to assist the start of the compressor motor in low-voltage operation. Available only on single-phase units.

1.3.1 Refrigeration System Options

Low-Pressure Switch and Low-Pressure Bypass Timer

Low-Pressure Switch: Used to protect the Liebert InteleCool2 if the evaporator blower fails, the air filter becomes clogged, the refrigeration circuit malfunctions or if there is loss of refrigerant. The low-pressure switch is activated when the suction pressure drops below its cutout setting. When activated, the low-pressure switch inhibits operation of the compressor and condenser fan. The switch will automatically reset once the system pressure rises above its cut-in setting.

Low-Pressure Bypass Timer: Also known as the Condenser Low Ambient Control or Winter Start Option), the low-pressure switch is used to start the system when the outdoor temperature is low. A few minutes after startup, the low-pressure switch resumes normal operation. This option can be used for applications down to 50°F (10°C). For control down to -20°F (-28.9°C), use the T-pack1 or T-pack2.

T-pack1

This option provides a Low-Pressure Switch, a Low-Pressure Bypass Timer (described above), and a Fan Cycle Control. This option package is one of the preferred control packages for telecommunication industry applications.

The Fan Cycle Control, also known as the Condenser Fan Cycling Control, consists of a reverse-acting pressure switch. When the outdoor temperature is low, the pressure switch cycles the condenser fan to maintain discharge pressures that will allow the systems to function. It is to be used when the outdoor ambient temperature is lower than 50°F (10°C) down to -20°F (-28.9°C).

T-pack2

This option includes a Low-Pressure Switch, a Low-Pressure Bypass Timer (described above), and an adjustable Fan Cycle Control, which acts as described in the preceding paragraph, except that it is adjustable. This option package is one of the preferred control packages for telecommunication industry applications.

1.4 Ancillary Components

Wall-Mounted Thermostat

The thermostat provides for heating/cooling application with separate fan control. Supplied with a thermostat sub-base.

Indoor Supply/Return Grilles

The supply grille is an aluminum louvered, double deflection type grille allowing user adjustment of direction of air distribution. The return grille is an aluminum louvered, fixed, single-deflection style grille.

Additional Spare Filters

Additional sets of the MERV 7 efficiency filters based on ASHRAE standard 52.2 (20% based on ASHRAE standard 52.1) may be selected.

1.5 Accessories

Liebert Dual Unit Control

The hinged-cover, dual unit control has a two-stage heat/cool thermostat with individual heating and cooling setpoints, adjustable interstage differentials and bimetal elements. The control features a solid state timer with 1-2-4-8 day sequence. Unit lead selector, Unit 1 and 2 power-on LEDs, Unit 1 or 2 lead unit LEDs, 48 hour program save on loss of power, industry-standard connections and 24V power from each unit. The DUC provides auto sequencing and displays on-status and operating-status parameters.

2.0 INSTALLATION

2.1 Preparation

2.1.1 Room Preparation

The room should be well-insulated and sealed to reduce airborne contaminants from penetrating the site. Outside air may be introduced through the damper option or be used for economized cooling by using the Economizer option. However, uncontrolled outside air should be kept to a minimum. Outside air adds to the cooling, heating and filtration loads of the site. Doors should be properly sealed to minimize leaks and should not contain grilles.

2.1.2 Location Considerations

The Liebert InteleCool2 unit is field-mounted on an outside wall. Additional framing in the wall may be required to ensure adequate structural support.

The outdoor area near the condenser supply and discharge must also be considered. To ensure adequate air supply, the unit should be mounted in a clean area, away from loose dirt and foreign matter that may clog the condenser coil. The unit should not be located near steam, hot air or fume exhausts. Also, the unit should not be mounted closer than 12 feet (3.7 m) from an opposing wall, obstruction or unit. For service clearance, provide 36" (914mm) in front of the unit, and 30" (762mm) on each side. When mounting units side-by-side, provide a minimum of 36" (914mm) between adjacent units unless the adjacent units will not be run at the same time. In this case, the units may be placed as close as 18" (457mm) apart. However, this will make the units more difficult to service. In such situations, consider the compressor location option for improved serviceability. Before mounting units, check local codes for applicable clearances.

2.1.3 Equipment Inspection

Upon delivery of the unit, inspect all items for visible damage. Concealed damage may be discovered later during installation. Report any damage to the shipper immediately and file a damage claim. Also, forward a copy of the damage claim to your Emerson® supplier.

2.2 Unit Installation

The Liebert InteleCool2 is designed to be installed against, and through, an outside wall. Two openings in the wall are required for the evaporator supply and return. Provide 1/2" (12.7mm) clearance on wall openings for supply and return air. Install the unit in a level position to ensure proper refrigerant flow, oil return and condensate drain. To install the unit, follow the instructions below.

WARNING

Risk of inadequate wall strength or improper unit mounting. Can cause wall collapse or unit to fall off the wall resulting in building and equipment damage, serious injury or death.

Installer must verify that the wall and the mounting fasteners are structurally adequate to support the weight of the unit during all phases of operation.

1. Verify that the mounting wall is structurally adequate to support the weight of the unit during start, stop and operation cycles. Emerson recommends that the installer have a professional structural engineer evaluate the wall strength and determine the correct fastener type and size. See **Tables 6-13** for static unit weights. Note that some vibration will occur during start, stop and operation cycles. The wall may need to be reinforced to support the maximum load of the unit.
2. Using a chalk line, mark the outside wall with a level horizontal line where the bottom of the unit is to rest.
3. Prepare supply and return openings in an outside wall, measuring from the chalk line.
4. Prepare the wall mounting holes. The mounting holes may be pilot holes for lag screws or clearance holes for bolts that will extend through the wall as determined by the structural engineer. Refer to **Figure 1** for the location of these holes.
5. Fasten the unit mounting base angle to the outside wall with the mounting fasteners as specified by the structural engineer.

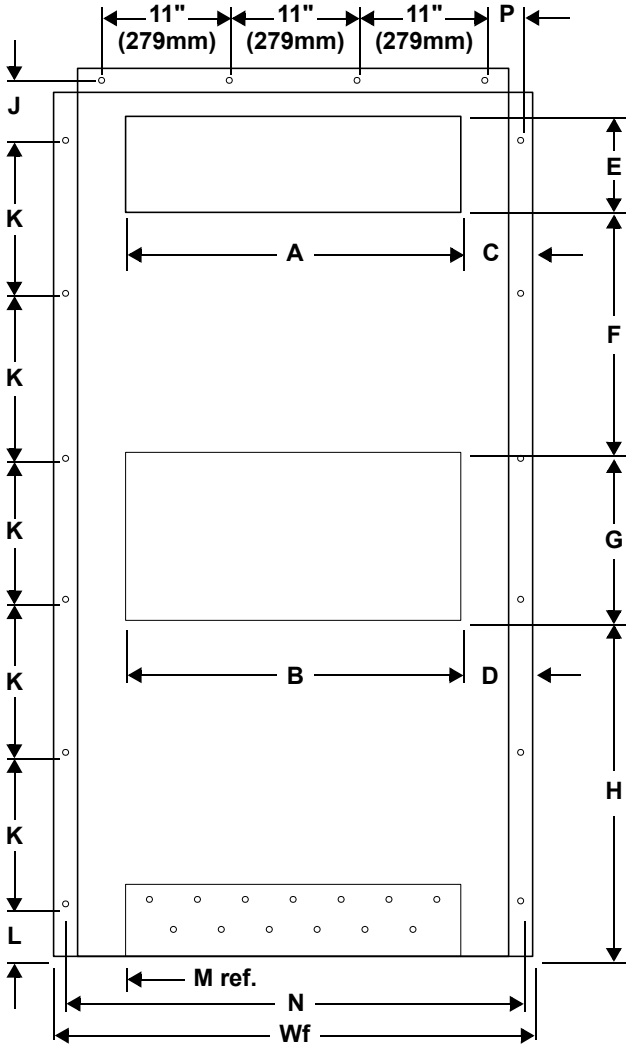
WARNING

Risk of improper handling of heavy unit—330-490 lb. (150-222kg). Can cause injury or death. Use caution, OSHA recommended safe lifting practices and lifting equipment that is rated for the unit weight to place the unit on the base angle. See **Tables 6-13** for unit weights.

6. With the unit front panel removed, lift the unit onto the base angle, making certain that the rear unit angle falls behind the turned-up front edge of the mounting angle. Insert top and side unit fasteners in holes and tighten, drawing the unit into place.
7. Verify that all mounting fasteners are properly installed and tightened according to the structural engineer's recommendation.

   Do not attach ducts to unit prior to installing unit.
8. Caulk and flash the top and sides as required to form a watertight seal. Emerson recommends using top flashing (field-supplied) to ensure that water does not run behind unit. All unit tops are sloped to allow water to run off.

Figure 1 Unit mounting dimensions



See Table 1 below for keys to dimensions.

Table 1 Mounting dimensions

Liebert InteleCool2 dimensional data in. (mm)																
Model Size	**Wf**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**P**
2 Ton	38-3/4 (984)	20 (508)	20 (508)	9-3/8 (238)	9-13/32 (239)	8 (203)	20-3/4 (527)	12 (305)	25-1/16 (638)	5-15/32 (139)	12 (305)	3-25/32 (96)	4-1/2 (114)	37-7/8 (962)	2-15/32 (63)
3 Ton	38-3/4 (984)	28 (711)	28 (711)	5-3/8 (137)	5-3/8 (137)	8 (203)	18 (457)	14 (356)	26 (660)	5-15/32 (139)	12 (305)	3-25/32 (96)	4-1/2 (114)	37-7/8 (962)	2-15/32 (63)
4-5 Ton	42-3/4 (1086)	30-1/4 (768)	29-7/8 (759)	6-1/4 (159)	6-7/16 (164)	9-7/8 (251)	30 (762)	15-7/8 (403)	25-25/64 (645)	1-45/64 (43)	16 (406)	61/64 (24)	6-1/2 (165)	41-3/4 (1060)	4-3/8 (111)

2.3 Piping Connections

The Liebert InteleCool2 is a self-contained, packaged unit. All refrigerant piping connections are made at the factory, so no external condenser is required. The evaporator coil condensate drain is factory-supplied and drains outdoors through the unit base pan. The condensate drain tubing should be checked to be certain that it is placed through the hole provided in the base pan.

2.4 Ducting

Field-supplied ducting can be attached to the unit duct connection once the unit has been mounted on the outside wall. The total external static pressure for the duct, including grille, must not exceed the values shown in **Table 5** and **Table 6**. Indoor discharge air rates are also given in the same tables.

2.5 Electrical Connections

WARNING

Risk of electric shock. Can cause injury and death.

Open all local and remote electric power supply disconnect switches before working within the electrical connection enclosures.

Use voltmeter to make sure power is turned Off before making any electrical connections.

NOTE

Refer to electrical schematic when making connections.

Each unit is shipped from the factory with all internal wiring completed. Refer to the electrical schematic when making connections. Electrical connections to be made at the installation site are: line voltage power supply to the power input and control wiring to remote control (customer-supplied or Emerson option).

NOTE

Do not run control wiring with high-voltage wiring. High-voltage can interfere with control signals and cause poor or erratic equipment performance.

2.5.1 Power Connections

All power and control wiring and ground connections must be in accordance with the National Electrical Code and local codes.

Use copper wiring only. Make sure that all connections are tight.

Make sure that the voltage supplied agrees with the voltage specified on the unit nameplate. The Liebert InteleCool2 comes standard with a factory-installed circuit breaker, accessible through an external access panel. An external, wall-mounted power disconnect switch (field-supplied) may be required for local codes. If necessary, this switch should be wired according to those codes.

For access to the electrical enclosure:

- Remove the screws securing the middle panel and pull the panel down and forward to remove.
- Remove the screws securing the electric box cover and remove cover.
- Verify that the unit wiring is correct for the actual input power. Some units are built with multi-voltage serial tags. The transformer may need to be re-tapped if the actual input voltage is different (see serial tag and electrical schematic).

Route the supply power to the customer-supplied disconnect switch (if required) and then to the unit circuit breaker inside the unit. Route the conduit to the hole provided in the cabinet. Connect the earth ground to the lug provided near the circuit breaker. Refer to the unit wiring diagram supplied on the inside of the electrical enclosure cover.

NOTE

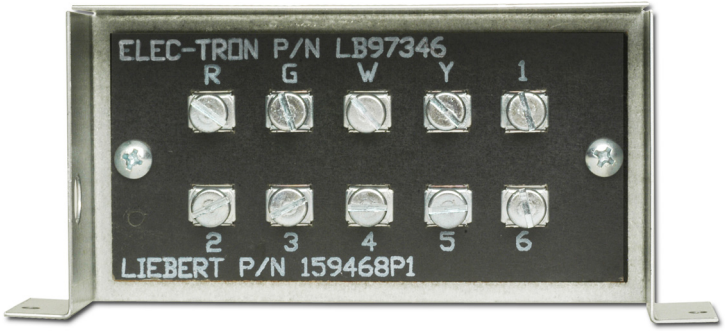
The optional three-phase scroll compressor must rotate in the correct direction to ensure proper system operation. Wiring must be phased and connected as shown:

- *PHASE "A" to T1 or L1*
- *PHASE "B" to T2 or L2*
- *PHASE "C" to T3 or L3*

2.5.2 Control Connections

Control wiring will be required for the remote control device. This remote device may be a factory- or field-supplied wall thermostat or similar device. Connections to the unit are made using customary HVAC low-volt wiring terminals R, G, W, and Y. For detailed locations of the low-volt wiring terminals, refer to the **Figure 10 - Electric panels**.

Figure 2 Low-volt wiring terminals



Liebert Thermostat

See **2.5.2 Control Connections** for further information; refer to the detailed instructions that ship with the thermostat.

NOTE

If this control is replacing a control that contains mercury in a sealed tube, do not place the old control in the trash. Contact the local waste management authority for instructions regarding recycling and the proper disposal of an old control containing mercury in a sealed tube.

If you have questions, contact the thermostat manufacturer.

Liebert Dual Unit Control

The Liebert Dual Unit Control is designed to control two Liebert InteleCool2 units in a "lead/lag" fashion. The control contains an electronic timer for switching the operating sequence of two units on a one-, two-, four-, or eight-day basis. It also contains a two-stage heat/two-stage cool thermostat with individual heat and cool set points. Light emitting diodes (LEDs) indicate Lead Unit 1 or 2 and power from Unit 1 or 2. The schedule for lead/lag switchover is adjustable by moving jumpers on the printed circuit board. A jumper is also used to change lead and lag unit before a scheduled changeover (if necessary for servicing).

NOTICE

Risk of improper installation. Can cause equipment damage.

The original Dual Unit Control (part # 153054G1, produced through March 2002), is phase sensitive. The latest version Dual Unit Control (Part # 171170G1) is not. Refer to specific installation instructions supplied with each control. Failure to follow specific instructions may damage the control and/or the unit and void the warranty.

NOTE

If this control is replacing a control that contains mercury in a sealed tube, do not place the old control in the trash.

Contact the local waste management authority for instructions regarding recycling and the proper disposal of an old control containing mercury in a sealed tube.

If you have questions, contact the thermostat manufacturer.

2.6 Outside Air Damper—Optional

Units supplied with a fixed (non-modulating) outdoor air damper can be adjusted as follows:

1. Remove the screws from the middle panel and remove panel.
2. Loosen the damper plate screws on the backside of the middle panel.
3. Adjust the damper plate to the desired position and tighten damper plate screws.
4. Replace panels.

2.7 Economizer - Optional

Installation

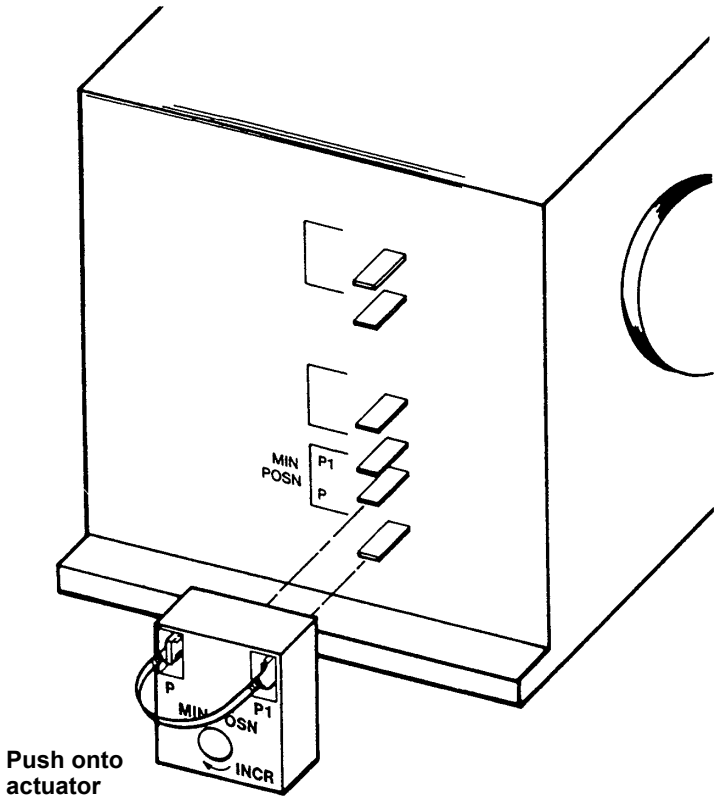
Insert the top flanged edge of the Economizer hood into the Economizer opening on the unit front panel. Next, attach the bottom left and right corner of the hood with screws (supplied).

Adjustment

Units supplied with Economizer requiring outside air can be adjusted as follows:

1. Run motor to fully closed position and disconnect 24 VAC from terminals TR and TR1.
2. Connect minimum position potentiometer to terminals P and P1. (See **Figure 3**. T and T1 are disconnected.)
3. Reconnect 24VAC to terminals TR and TR1 and adjust potentiometer for desired minimum position by turning Q709 adjustment screw clockwise to increase minimum position; counterclockwise to decrease minimum position.

Figure 3 Mounting minimum position potentiometer on actuator



3.0 CHECKLIST FOR COMPLETE INSTALLATION

___ 1. Proper clearance for service access has been maintained.

___ 2. Equipment is level and mounting fasteners are tight.

___ 3. Ducting completed, if required.

___ 4. Line voltage to power wiring matches equipment nameplate.

___ 5. Power wiring connections completed to disconnect switches, including earth ground. Proper phase rotation has been observed so that scroll compressor will rotate in the correct direction.

___ 6. Power line circuit breakers or fuses have proper ratings for equipment installed.

___ 7. Control wiring connections completed to optional controls.

___ 8. All wiring connections are tight.

___ 9. Foreign materials have been removed from in and around all equipment installed (shipping materials, construction materials, tools, etc.).

___ 10. Fans and blowers rotate freely without unusual noise.

WARNING

Risk of electric shock. Can cause injury and death.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working within the electrical connection enclosures.

Potentially lethal voltages exist within this equipment during operation. Observe all cautions and warnings in this manual. Only qualified service and maintenance personnel should work with this equipment.

4.0 STARTUP PROCEDURE

Verify that installation is complete by using the **Checklist for Complete Installation**.

1. Disconnect all power to the Liebert InteleCool2 unit.
2. Adjust remote control to prevent compressor, heat and fan operation.
3. Turn on main breaker and check line voltage on main unit disconnect switch. Line voltage must be within ± 10 volts of nameplate voltage.
4. Turn ON main unit disconnect switch and check secondary voltage at transformer T1. Voltage at T1 must be 24 VAC ±2.5V.
5. From the remote control, verify proper operation in all modes.
6. Make sure all blowers, fans, and the scroll compressor are rotating in the correct direction.
7. Check the current draw on all line voltage components and compare with unit nameplate.
8. Check adjustment of the optional outside air damper for the desired balance between the flow of room air and outdoor air. Use a gauge or non-polluting airflow indicator.

NOTE

If the unit is supplied with crankcase heaters, Emerson recommends that the high voltage be applied between four and six hours before startup.

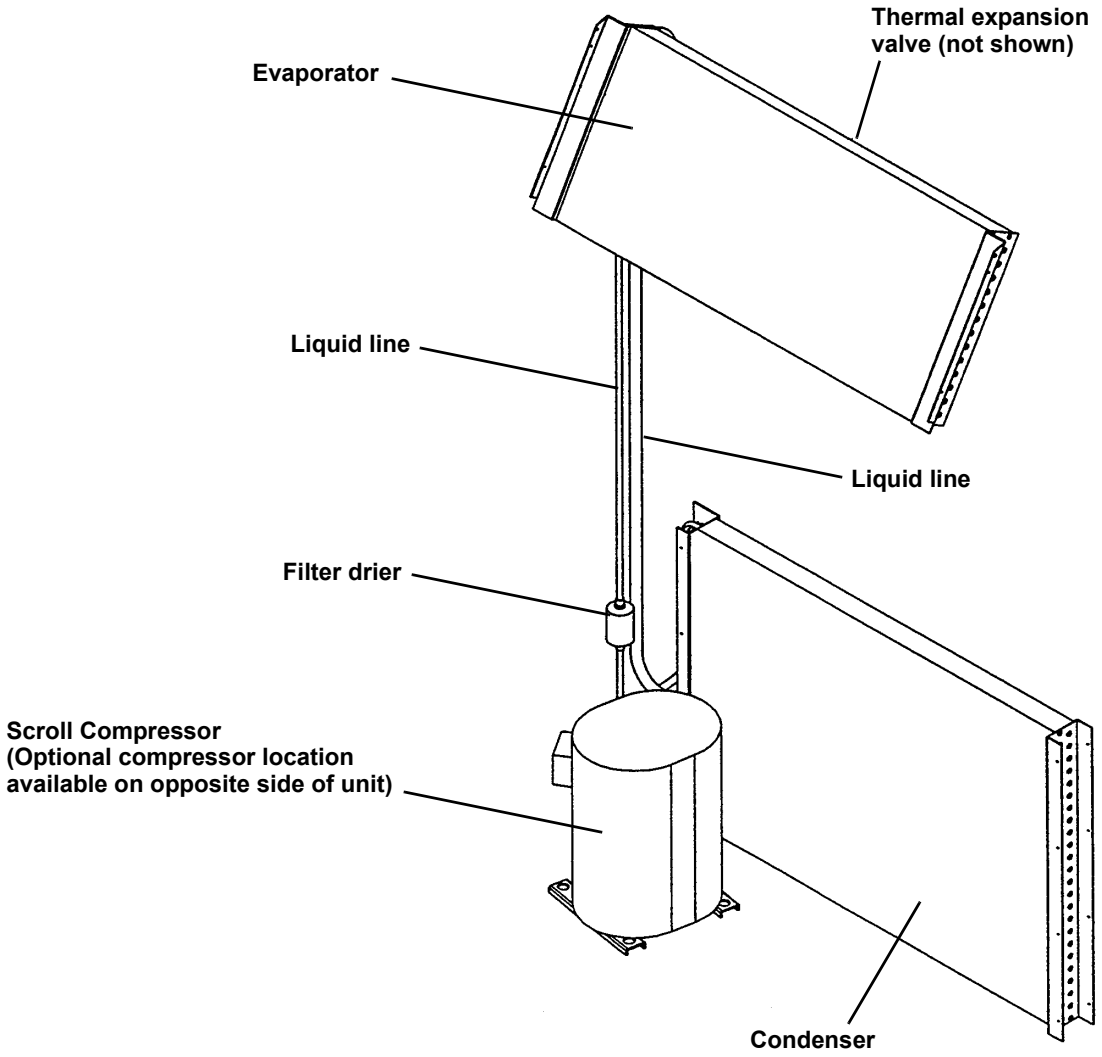
5.0 OPERATION

5.1 Compressorized Cooling

Compressorized cooling is provided by a high-efficiency system consisting of a compressor, thermostatic expansion valve, evaporator, and condenser coil.

The Liebert InteleCool2 uses R-407C refrigerant in a conventional vapor-compression refrigeration cycle. Heat is removed from the air in the space by blowing the air across the evaporator coil. As heat is transferred to the refrigerant in the evaporator, the refrigerant boils and turns to a warm vapor. The refrigerant vapor enters the compressor and is compressed, resulting in high pressure and temperature. After entering the condenser, the hot vapor is condensed to a liquid by the air blown across the condenser coil. Liquid refrigerant then passes through the thermal expansion valve and into the evaporator. The expansion reduces the pressure and temperature to complete the cycle.

Figure 4 Refrigeration system



Note: System is factory-piped and charged.

5.2 Economizer Cooling—Optional

The Economizer mode uses outside air to cool the room when the outside air temperature is cool enough to allow for economical cooling. Components include the damper, spring return direct drive actuator, enthalpy sensor and actuator control board with an integral mixed air sensor. Economizer operation is enabled when the outside conditions meet required temperature and humidity as set on the enthalpy sensor. If outdoor conditions are favorable on a call for cooling, the damper actuator will open the Economizer damper. The damper position will be controlled based on the mixed air temperature in the evaporator section. The factory-set mixed air temperature target is 50-56°F (10-13°C).

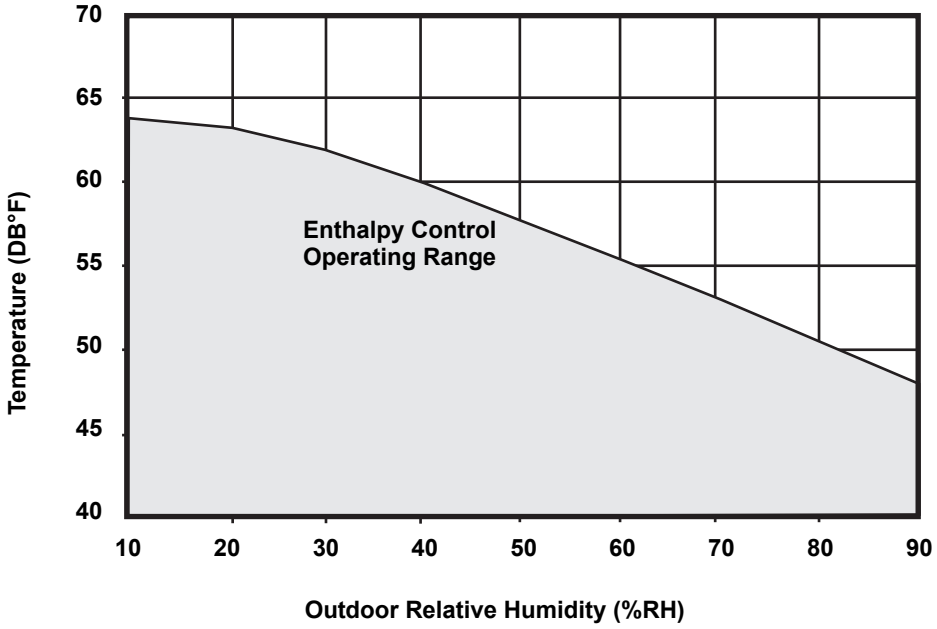
The amount of damper opening depends on the cooling capacity of the outside air; the cooler the outside air, the less that is needed to cool the room, and so a smaller damper opening is required. As the outside air temperature rises, the damper will open wider since more of that air is required to keep the room at the same temperature.

The Economizer and compressorized cooling will never operate at the same time. If outdoor conditions meet the required enthalpy sensor setpoint during a cooling cycle, the unit will automatically shut down the compressor and begin using outside air.

5.2.1 Enthalpy Sensor

The enthalpy sensor responds to the total heat content of the outdoor air to provide changeover from compressorized cooling to free-cooling operation. The changeover point is factory set (at the "D" position). This setting will ensure rated capacity when the outdoor conditions allow for Economizer cooling.

Figure 5 Enthalpy control setting



5.2.2 Actuator

The Economizer actuator is mounted in the lower part of the Economizer section below the electric box. It is accessible by opening the lower front panel. The actuator is a 24VAC, spring return device that will fully close the Economizer damper. The actuator has internal controls that allow it to operate based on signals from the enthalpy control and mixed air sensor.

5.3 Heating—Optional

On units supplied with optional resistance heating, a call for heating closes the heat relay and energizes the evaporator fan and resistive elements.

5.4 Unit Controls

5.4.1 Remote Control Interface

Control connections to the Liebert InteleCool2 unit use customary HVAC terminal designations R, G, W and Y. Contact closures between the 24VAC (R) and different control connections supply control voltage to the electric panel components responsible for the desired function. Operating modes are controlled by contact closures as follows:

Table 2 Operating modes/contact closures

Connection	Operating Mode
R	24VAC
G	Evaporator Fan
W	Heating
Y	Cooling (compressorized or Economizer)

Wall-mounted thermostats are to be low-voltage, snap action or mercury type. Unmanned sites should use a HEAT/COOL/AUTO type sub-base to provide automatic switchover during climate changes.

5.4.2 High Pressure (Standard)

The high-pressure switch is mounted in the liquid line. Electrically, it is connected in series with the compressor start circuit, which will shut down the compressor and condenser fan if the liquid pressure exceeds 400 PSIG (2758 kPa). This protects the Liebert InteleCool2 in the event of condenser motor failure or condenser coil blockage.

The pressure switch is an auto reset device. When the system pressure drops below 300 PSIG (2069 kPa), the switch will reset. (An optional lockout relay is available which allows the switch to be used as a manual reset safety.) If the call for cooling is present, the compressor start circuit will be energized and the compressor will start after the 3 minute anti-short cycle time.

5.4.3 Refrigeration Control Options

Please review the following table for the recommended control options based on the site ambient and your need for year-round operation.

Table 3 Recommended applications for control options

Application	Unit	Options	Min ambient	Max ambient
General	Standard	None	50°F (10°C)	105°F (40.6°C)
General	Standard	Low pressure with low-pressure bypass timer	50°F (10°C)	105°F (40.6°C)
General	Standard	T-pack1 or T-pack2	-20°F (-28.9°C)	105°F (40.6°C)
Telecom/365-Day Operation	Standard	T-pack1 or T-pack2	-20°F (-28.9°C)	105°F (40.6°C)
General	Standard	High ambient	50°F (10°C)	110°F (43°C)
General	Standard	High ambient, low pressure with low-pressure bypass timer	50°F (10°C)	110°F (43°C)
Telecom/365-day operation	Standard	High ambient with T-pack1 or T-pack2	-20°F (-28.9°C)	110°F (43°C)

Low-Pressure Switch and Low Pressure Bypass Timer (Winter Start)

Low-Pressure Switch—The low-pressure switch is mounted in the compressor suction line. Electrically, it is connected in series with the compressor start circuit, which will shut down the compressor and condenser fan if the suction pressure drops below 35 PSIG (241 kPa). The switch will automatically reset once the system pressure rises above its cut-in setting (60 psig, ±5 psig [414 kPa, ±34 kPa]). This protects the Liebert InteleCool2 in the event the evaporator fan fails, the filter becomes clogged or there is a loss of refrigerant. If the call for cooling is present, the compressor will start after the 3 minute anti-short cycle time.

Low-Pressure Bypass Timer—A low ambient temperature start relay is included with the low-pressure option. This relay locks out (ignores) the low-pressure switch on startup until the system pressure stabilizes. This bypass relay is adjustable and should be set for 3 minutes greater than the anti-short cycle timer setting. This option can be used for applications down to 50°F (10°C). For control down to -20°F (-28.9°C), use the T-pack1 and T-pack2 options, which include fan cycle control.

T-Pack1 Package

Includes a low-pressure switch, low-pressure bypass timer (described above) and fan cycle control.

Fan Cycle Control—Condenser Fan Cycling Control; allows the Liebert InteleCool2 unit to provide cooling to the space when the outdoor ambient temperature is lower than 50°F (10°C) and down to -20°F (-28.9°C). The control uses a reverse acting pressure switch mounted on the discharge line that cycles the condenser fan in response to the discharge pressure. On a call for cooling, when the discharge pressure increases to 250 PSIG (1723 kPa), the switch will close and start the condenser fan. When the pressure drops below 170 PSIG (1172 kPa), the switch will open and stop the condenser fan. During low outdoor temperatures, the pressure switch cycles the condenser fan to maintain discharge pressure that will allow the system to function.

NOTE
During normal operation in low ambient conditions, the condenser fan will cycle frequently.

T-Pack2 Package

Includes a low-pressure switch, low-pressure bypass timer and an adjustable fan cycle control. See descriptions above.

5.4.4 Anti-Short Cycle Timer—Standard

The anti-short cycle timer protects the compressor from continuous On-Off operation and restarts after momentary power failures. The timer used is adjustable and is set to a minimum of 3 minutes. The compressor will start immediately on startup and on any call for cooling after an Off cycle of more than 3 minutes.

5.4.5 Heater Protection—With Optional Heat

On units supplied with resistance heating, an auto reset heater safety and a one time (replaceable) thermal link protect the unit wiring and prevents excessive heat conditions caused by a dirty air filter or fan failure.

5.4.6 Lockout Relay—Optional

The lockout relay latches the detection of a high-pressure condition in the refrigeration circuit and prohibits operation of the compressor until the abnormal pressure conditions are acknowledged. The lockout relay is reset by cycling the unit main power or by changing the setpoint on the thermostat to temporarily eliminate a call for cooling. A normally open set of contacts is provided to Terminals 2 and 3 of the customer terminal strip for monitoring the status of the lockout relay when this option is supplied without the Common Alarm option.

5.4.7 Common Alarm—Optional

Alarm components are an evaporator air sail switch, evaporator high-temperature switch, control relays and an adjustable time delay relay with two normally open and two normally closed alarm contacts. The alarm contacts will activate in the event of a loss of airflow across the evaporator blower, high evaporator temperature or in the event that the compressor is not functioning due to an abnormal pressure condition. The adjustable time delay relay can be adjusted for a delay of up to 90 seconds to eliminate nuisance tripping of the alarm contacts. To detect low pressure, the optional low-pressure switch with bypass, T-pack1 or T-pack2 must also be selected.

6.0 MAINTENANCE

WARNING

Risk of electric shock. Can cause injury and death.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working within the electrical connection enclosures.

Potentially lethal voltages exist within this equipment during operation. Observe all cautions and warnings in this manual. Only qualified service and maintenance personnel should work with this equipment.

6.1 Filters

Replaceable evaporator air filter(s) are supplied with the unit. The filter(s) are easily serviceable from the outside, through the top front access panel.

Filters are usually the most-neglected item in a Thermal Management system. To maintain efficient operation, they should be checked monthly and changed as required. Units supplied with Economizers may require replacement filters more frequently because of airborne dust and organic materials.

Filters can be replaced from the front by opening the lower front access panel.

WARNING

Risk of electric shock. Can cause injury and death.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before replacing filters.

6.2 Blower Package

Periodic checks of the blower package include: blower wheels, housings, motor and motor mounting bracket. With the power off, inspect and remove any debris from the wheels and housings. Also check to see that they are tightly mounted on the motor shaft and rotate freely without rubbing against the housing.

WARNING

Risk of electric shock. Can cause injury and death.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before inspecting the blower equipment.

6.3 Economizer—Optional

Each month, the Economizer should be inspected and any debris removed from the intake hood, damper blade and enthalpy sensor.

6.4 Heat

Heaters can be serviced and/or removed from inside through the discharge opening or from outside by removing the top.

WARNING

Risk of electric shock. Can cause injury and death.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working on the heaters.

6.5 Refrigeration System

Each month, the components of the refrigeration system should be inspected for proper function and signs of wear. Since, in most cases, evidence of malfunction is present prior to component failure, periodic inspections can be a major factor in the prevention of most system failures.

6.5.1 Refrigerant Lines

Check all refrigerant lines and capillaries for vibration isolation, and support as necessary. Visually inspect all refrigerant lines for leaks.

6.5.2 Discharge Pressure

Discharge pressure can be increased or decreased by load conditions or condenser efficiency. The high-pressure switch will shut the compressor/contactor at its cut-out setting of 400 PSIG (2758 kPa). See **5.4.2 High Pressure (Standard)**.

6.5.3 Thermostatic Expansion Valve

The thermostatic expansion valve (TEV) keeps the evaporator supplied with enough refrigerant to satisfy load conditions. It does not turn the compressor On or Off, but maintains proper refrigerant superheat in the suction gas to the compressor.

Determine TEV operation by measuring superheat. If too little refrigerant is being fed to the evaporator, the superheat will be high; if too much refrigerant is being supplied, the superheat will be low. The correct superheat setting is between 10° and 20°F (5.5° and 11.1°C) under normal load conditions and "steady-state" operation. Some models of the Liebert InteleCool2 will be supplied with a non-adjustable expansion valve, so no adjustments are possible.

To adjust the superheat setting when an adjustable valve is used:

1. Remove the valve cap from the base of the valve.
2. Turn the adjustment stem counterclockwise to lower the superheat.
3. Turn the adjustment stem clockwise to increase the superheat.

NOTE
Make no more than 1/4 turn of the stem at a time. As long as 30 minutes may be required for the new balance to take place.

To determine superheat:

1. Measure the temperature of the suction line at the point where the TEV bulb is clamped.
2. Obtain the gauge pressure at the compressor suction valve.
3. Add the estimated pressure drop between bulb location and the suction valve.
4. Convert the sum of the two pressures to the saturated temperature.
5. Subtract this temperature from the actual suction line temperature. The difference is superheat.

6.5.4 Air-Cooled Condenser

Restricted airflow through the condenser coil will reduce the operating efficiency of the unit and can result in high compressor head pressure and loss of cooling.

Clean the condenser coil each time the evaporator filters are replaced. Check for bent or damaged coil fins and repair as needed. Check all refrigerant lines for leaks. Clean the condenser coil of all debris that will inhibit airflow. This can be done with compressed air or commercial coil cleaner.

6.6 Compressor

Infrequently, a fault in the motor insulation may result in a motor burn. However, in a properly installed system, burnouts rarely occur. Of those that do, most are the result of mechanical or lubrication failures, resulting in the burnout as a secondary consequence.

If the problems that can cause compressor failures are detected and corrected early, a large percentage can be prevented. Periodic maintenance inspections by alert service personnel on the lookout for abnormal operation can be a major factor in reducing maintenance costs. It is easier and far less costly to take the steps necessary to ensure proper system operation than it is to allow a compressor to fail and require replacement.

When troubleshooting a compressor, check all electrical components for proper operation, including all fuses and circuit breakers and pressure switch operation.

If a compressor failure has occurred, determine whether it is an electrical or mechanical failure.

Mechanical Failure

A mechanical compressor failure will not be indicated by a burned odor. The motor will attempt to run. If you have determined that a mechanical failure has occurred, the compressor must be replaced.

Electrical Failure

An electrical failure will be indicated by a distinct, pungent odor. If a severe burnout has occurred, the oil will be black and acidic. If a burnout does occur, correct the problem that caused the burnout and clean the system thoroughly using the proper procedure. It is important to note that successive burnouts of the same system are usually caused by improper cleaning.

NOTICE

Risk of contaminated system. Can cause equipment damage.

Damage to a replacement compressor caused by improper system cleaning constitutes abuse under the terms of the warranty and the WARRANTY WILL BE VOIDED.

There are two kits that can be used with a complete compressor burnout: Sporlan System Cleaner and Alco Dri-Kleener. Whichever kit is used, follow the manufacturer's procedure.

CAUTION

Risk of contact with caustic material. Can cause personal injury.

Avoid skin contact with the refrigerant and oils. Severe burns will result. Wear long rubber gloves when handling contaminated parts.

6.6.1 Compressor Replacement

Replacement compressors are available from your Emerson® supplier. They will be shipped in a reusable crate to the job site as required by the service contractor.

Upon shipping a replacement compressor, the service contractor will be billed in full for the compressor until the failed compressor has been returned to the factory.

The compressor should be returned in the same container used for shipping to the job. The possible damage causes or conditions that were found should be recorded by marking the compressor return tag.

1. Disconnect power.
2. Attach suction and discharge gauges to access fittings.
3. Recover refrigerant using standard recovery procedures and equipment. Use a filter drier when charging the system with recovered refrigerant.

CAUTION

Risk of explosive discharge of high-pressure refrigerant. Can cause personal injury or equipment damage.

Do not loosen any refrigeration connections before relieving system pressure from both sides of the compressor.

NOTE

Release of refrigerant to the atmosphere is harmful to the environment and is unlawful. Refrigerant must be recycled or discarded in accordance with federal, state, and local regulations.

4. Disconnect all electrical connections.
5. Remove failed compressor.

NOTE

The optional three-phase scroll compressor must rotate in the correct direction to ensure proper system operation. Wiring must be phased and connected as shown:

- *PHASE "A" to T1 or Ll*
- *PHASE "B" to T2 or L2*
- *PHASE "C" to T3 or L3*

6. Install replacement compressor and make all connections.
7. Pressurize and leak test the system at approximately 150 PSIG (1034 kPa) pressure.
8. Follow manufacturer's instructions for cleanout kits.
9. Connect a vacuum pump to both the high and low sides of the system through properly sized connections. Evacuate the system twice to 1500 microns, and the third time to 500 microns. Break the vacuum each time with dry nitrogen to 2 PSIG (13.8 kPa).
10. Charge the system with refrigerant. Refer to unit serial tag for refrigerant charge amount.
11. Apply power and operate system.
12. Check for proper operation. Suction and discharge pressures will vary with load conditions and coil efficiency. The low-pressure switch will shut the compressor down if the suction pressure falls below the cutout setting. Conversely, the high-pressure switch will shut down the compressor if the discharge pressure exceeds the cutout setting. High suction pressure reduces the ability of the refrigerant to cool compressor components and can result in compressor damage. Refer to **Table 4**.

NOTE

High-side gauge port is a liquid line connection. Proper procedures should be followed when installing and removing gauges. A 6-foot (1.8 m) hose can hold up to 3 oz (0.1 l) of refrigerant. Be sure to purge high side to low prior to removal.

Table 4 Pressure information

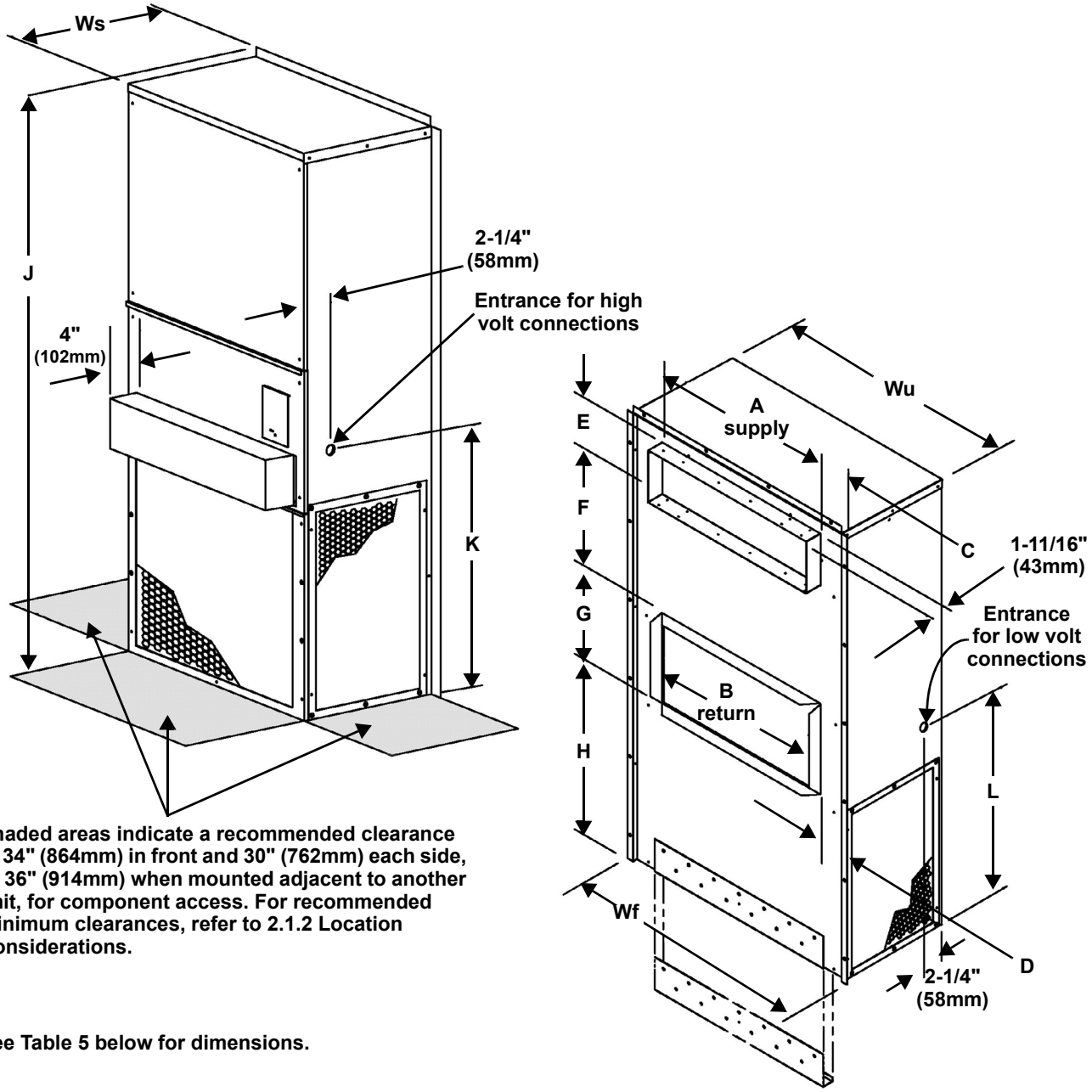
Design Pressures psig (kPA)	Minimum psig (kPa) R-407C	Maximum psig (kPa) R-407C
Suction	35 (241)	90 (620)
	Liquid (Approx.)	PSIG (kPa)
	95°F (35°C) Ambient	250-290 (1723-2000)
	Maximum	360-380 (2480-2618)
	High-Pressure Cutout	400 (2756)

Based on indoor conditions of 80°F (26.7°C), 50% RH, with clean filter(s).

7.0 SPECIFICATIONS

7.1 Dimensional Data

Figure 6 Dimensional data



Shaded areas indicate a recommended clearance of 34" (864mm) in front and 30" (762mm) each side, or 36" (914mm) when mounted adjacent to another unit, for component access. For recommended minimum clearances, refer to 2.1.2 Location Considerations.

See Table 5 below for dimensions.

Table 5 Liebert InteleCool2 dimensions, in. (mm)

Dimensions, in. (mm)														
Model	**Wu**	**Ws**	**Wf**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
2 Ton	37-1/8 (943)	17-3/4 (451)	38-3/4 (984)	20 (508)	20 (508)	9-3/8 (238)	9-13/32 (239)	8 (203)	20-3/4 (527)	12 (305)	25-1/16 (638)	69-3/4 (1772)	36-3/16 (919)	31-5/8 (803)
3 Ton	37-1/8 (943)	17-3/4 (451)	38-3/4 (984)	28 (711)	28 (711)	5-3/8 (137)	5-3/8 (137)	8 (203)	18 (457)	14 (356)	26 (660)	69-3/4 (1772)	36-3/16 (919)	31-5/8 (803)
4/5 Ton	41 (1041)	22-1/2 (572)	42-3/4 (1086)	30-1/4 (768)	29-7/8 (759)	6-1/4 (159)	6-7/16 (164)	9-7/8 (251)	30 (762)	15-7/8 (403)	25-25/64 (645)	83 (2108)	44 (1118)	39-1/2 (1003)

7.2 Technical Data

Table 6 Technical data, 60 Hz - Standard ambient condenser

Model		ET024	ET036
Compressor type		**Scroll**	**Scroll**
Net capacity data based on 80°F (26.6°C) DB/67°F (19.4°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	22300 (6.5)	34400 (10.1)
	Sensible	17200 (5.0)	24300 (7.1)
95°F (35.0°C)	Total	21400 (6.3)	32900 (9.6)
	Sensible	16900 (5.0)	23800 (6.9)
105°F (40.6°C) **	Total	20400 (6.0)	31300 (9.1)
	Sensible	16600 (4.9)	23100 (6.8)
Net capacity data based on 75°F (23.9°C) DB/62.5°F (16.9°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	20700 (6.1)	32100 (9.4)
	Sensible	16700 (4.9)	23800 (7.0)
95°F (35.0°C)	Total	19900 (5.8)	30700 (9.0)
	Sensible	16400 (4.8)	23100 (6.8)
105°F (40.6°C) **	Total	18900 (5.5)	29300 (8.6)
	Sensible	16000 (4.7)	22500 (6.6)
Evaporator Air Flow - Dry Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		930 (1580)	1300 (2210)
0.1 - IN WG (25 Pa)		880 (1500)	1220 (2070)
0.2 - IN WG (50 Pa)		840 (1430)	1130 (1920)
0.3 - IN WG (75 Pa)		800 (1360)	1030 (1750)
0.4 - IN WG (100 Pa)		730 (1240)	920 (1560)
0.5 - IN WG (125 Pa)		650 (1100)	820 (1390)
Evaporator Air Flow - Wet Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		910 (1550)	1200 (2040)
0.1 - IN WG (25 Pa)		860 (1460)	1120 (1900)
0.2 - IN WG (50 Pa)		820 (1390)	1030 (1750)
0.3 - IN WG (75 Pa)		780 (1320)	940 (1600)
0.4 - IN WG (100 Pa)		710 (1210)	850 (1440)
0.5 - IN WG (125 Pa)		620 (1050)	750 (1270)
Evaporator			
Motor hp (kW)		0.25 (0.19)	0.25 (0.19)
Filter Sizes - Quantity in. (cm)		16 x 32.5 x 2 - one (40.6 x 82.5 x 5)	16 x 32.5 x 2 - one (40.6 x 82.5 x 5)
Drain Connection - ID in.		3/4	3/4
Weight w/o Economizer, lb (kg)		330 (150)	330 (150)
Weight w/ Economizer, lb (kg)		350 (159)	350 (159)

* Based on rated airflow at 0.2 IN WG (50 Pa) external static and no outside air.

** Use high ambient option for high ambients.

Table 7 Technical data, 60 Hz - Standard ambient condenser, continued

Model		ET048	ET060
Compressor Type		**Scroll**	**Scroll**
Net capacity data based on 80°F (26.6°C) DB/67°F (19.4°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	47900 (14.0)	56900 (16.7)
	Sensible	35400 (10.4)	38800 (11.4)
95°F (35.0°C)	Total	45600 (13.4)	53800 (15.8)
	Sensible	34600 (10.2)	37700 (11.1)
105°F (40.6°C) **	Total	43100 (12.6)	50700 (14.9)
	Sensible	33800 (9.9)	36800 (10.8)
Net capacity data based on 75°F (23.9°C) DB/62.5°F (16.9°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	44500 (13.0)	52200 (15.3)
	Sensible	35000 (10.3)	38200 (11.2)
95°F (35.0°C)	Total	42300 (12.4)	49800 (14.6)
	Sensible	34100 (10.0)	36900 (10.8)
105°F (40.6°C) **	Total	39900 (11.7)	47300 (13.9)
	Sensible	33100 (9.7)	35700 (10.4)
Evaporator Air Flow - Dry Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		2030 (3450)	2030 (3450)
0.1 - IN WG (25 Pa)		1910 (3240)	1910 (3240)
0.2 - IN WG (50 Pa)		1770 (3010)	1770 (3010)
0.3 - IN WG (75 Pa)		1650 (2800)	1650 (2800)
0.4 - IN WG (100 Pa)		1520 (2580)	1520 (2580)
0.5 - IN WG (125 Pa)		1390 (2360)	1390 (2360)
Evaporator Air Flow			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		1800 (3060)	1800 (3060)
0.1 - IN WG (25 Pa)		1680 (2850)	1680 (2850)
0.2 - IN WG (50 Pa)		1580 (2680)	1580 (2680)
0.3 - IN WG (75 Pa)		1470 (2500)	1470 (2500)
0.4 - IN WG (100 Pa)		1360 (2310)	1360 (2310)
0.5 - IN WG (125 Pa)		1250 (2120)	1250 (2120)
Evaporator			
Motor hp (kW)		0.50 (0.37)	0.50 (0.37)
Filter Sizes - Quantity, in. (cm)		21 x 36.25 x 2 - one (53.3 x 92 x 5)	21 x 36.25 x 2 - one (53.3 x 92 x 5)
Drain Connection - ID, in.		3/4	3/4
Weight - w/o Economizer, lb/kg		470 (213)	470 (213)
Weight - with Economizer, lb (kg)		490 (222)	490 (222)

* Based on rated airflow at 0.2 IN WG (50 Pa) external static and no outside air.

** Use high ambient option for high ambients.

Table 8 Technical data, 50 Hz - Standard ambient condenser

Model		ET035
Compressor type		**Scroll**
Net capacity data based on 26.6°C (80°F) DB/19.4°C (67°F) WB indoor ambient - kW (BTUH)*		
Outdoor ambient		
29.4°C (85°F)	Total	8.3 (28200)
	Sensible	6.2 (21300)
35.0°C (95°F)	Total	7.8 (26600)
	Sensible	6.1 (20700)
40.6°C (105°F) **	Total	7.3 (24900)
	Sensible	5.9 (20000)
Net capacity data based on 23.9°C (75°F) DB 16.9°C (62.5°F) WB indoor ambient - kW (BTUH)*		
Outdoor ambient		
29.4°C (85°F)	Total	7.7 (26200)
	Sensible	6.2 (21000)
35.0°C (95°F)	Total	7.2 (24700)
	Sensible	6.0 (20400)
40.6°C (105°F) **	Total	6.8 (23300)
	Sensible	5.8 (19700)
Evaporator Air Flow - Dry Coil		
External Static Pressure		**CFM (m^3/hr)**
0.0 Pa (0.0 - IN WG)		1080m (1840)
25 Pa (0.1 - IN WG)		1020 (1730)
50 Pa (0.2 - IN WG)		940 (1600)
75 Pa (0.3 - IN WG)		860 (1460)
100 Pa (0.4 - IN WG)		—
125 Pa (0.5 - IN WG)		—
Evaporator Air Flow - Wet Coil		
External Static Pressure		**CFM (m^3/hr)**
0.0 Pa (0.0 - IN WG)		1000 (1700)
25 Pa (0.1 - IN WG)		930 (1590)
50 Pa (0.2 - IN WG)		860 (1460)
75 Pa (0.3 - IN WG)		780 (1330)
100 Pa (0.4 - IN WG)		—
125 Pa (0.5 - IN WG)		—
Evaporator		
Motor kW (hp)		0.19 (0.25)
Filter Sizes - Quantity, cm (in.)		16 x 32.5 x 2 - one (40.6 x 82.5 x 5)
Drain Connection - ID, in.		3/4 (1.9)
Weight - w/o Economizer, kg (lb)		150 (330)
Weight - with Economizer, kg (lb)		159 (350)

* Based on rated airflow at 50 Pa (0.2 IN WG) external static and no outside air.

** Use high ambient option for high ambients.

Table 9 Technical data, 50 Hz - Standard ambient condenser, continued

Model		ET047	ET059
Compressor type		**Scroll**	**Scroll**
Net capacity data based on 26.6°C (80°F) DB/19.4°C (67°F) WB indoor ambient - kW (BTUH)*			
Outdoor ambient			
29.4°C (85°F)	Total	11.8 (40400)	14.2 (48500)
	Sensible	8.7 (29900)	9.6 (33100)
35.0°C (95°F)	Total	11.2 (38300)	13.6 (46600)
	Sensible	8.6 (29300)	9.5 (32400)
40.6°C (105°F) **	Total	10.6 (36200)	12.9 (44400)
	Sensible	8.4 (28600)	9.2 (31600)
Net capacity data based on 23.9°C (75°F) DB/16.9°C (62.5°F) WB indoor ambient - kW (BTUH)*			
Outdoor Ambient			
29.4°C (85°F)	Total	10.9 (37400)	13.3 (45500)
	Sensible	8.6 (29200)	9.5 (32400)
35.0°C (95°F)	Total	10.4 (35500)	12.7 (43600)
	Sensible	8.4 (28400)	9.2 (31600)
40.6°C (105°F)**	Total	9.9 (33600)	12.2 (41600)
	Sensible	8.1 (27700)	9.0 (30900)
Evaporator Air Flow - Dry Coil			
External Static Pressure		**m^3/hr (CFM)**	**m^3/hr (CFM)**
0.0 Pa (0.0 - IN WG)		2870 (1690)	2870 (1690)
25 Pa (0.1 - IN WG)		2700 (1590)	2700 (1590)
50 Pa (0.2 - IN WG)		2500 (1470)	2500 (1470)
75 Pa (0.3 - IN WG)		2330 (1370)	2330 (1370)
100 Pa (0.4 - IN WG)		—	—
125 Pa (0.5 - IN WG)		—	—
Evaporator Air Flow - Wet Coil			
External Static Pressure		**m^3/hr (CFM)**	**m^3/hr (CFM)**
0.0 Pa (0.0 - IN WG)		2550 (1500)	2550 (1500)
25 Pa (0.1 - IN WG)		2380 (1400)	2380 (1400)
50 Pa (0.2 - IN WG)		2240 (1320)	2240 (1320)
75 Pa (0.3 - IN WG)		2070 (1220)	2070 (1220)
100 Pa (0.4 - IN WG)		—	—
125 Pa (0.5 - IN WG)		—	—
Evaporator			
Motor kW (hp)		0.37 (0.5)	0.37 (0.5)
Filter Sizes - Quantity, cm (in.)		53.3 x 92 x 5 - one (21 x 36.25 x 2)	53.3 x 92 x 5 - one (21 x 36.25 x 2)
Drain Connection - ID, in.		3/4	3/4
Weight - w/o Economizer, kg (lb)		213 (470)	213 (470)
Weight - with Economizer, kg (lb)		222 (490)	222 (490)

* Based on rated airflow at 50 Pa (0.2 IN WG) external static and no outside air.
** Use high ambient option for high ambients.

Table 10 Technical data, 60 Hz - High ambient condenser

Model		ET024	ET036
Compressor type		**Scroll**	**Scroll**
Net capacity data based on 80°F (26.6°C) DB/67°F (19.4°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	22600 (6.6)	34400 (10.1)
	Sensible	17200 (5.0)	24400 (7.2)
95°F (35.0°C)	Total	21700 (6.4)	32900 (9.6)
	Sensible	16900 (5.0)	23800 (6.9)
105°F (40.6°C)	Total	20700 (6.1)	31300 (9.1)
	Sensible	16600 (4.9)	23100 (6.8)
Net capacity data based on 75°F (23.9°C) DB/62.5°F (16.9°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	20800 (6.1)	32100 (9.4)
	Sensible	16800 (4.9)	24100 (7.1)
95°F (35.0°C)	Total	20000 (5.9)	30700 (9.0)
	Sensible	16500 (4.8)	23400 (6.9)
105°F (40.6°C)	Total	19000 (5.6)	29300 (8.6)
	Sensible	16100 (4.7)	22600 (6.6)
Evaporator Air Flow - Dry Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		930 (1580)	1300 (2210)
0.1 - IN WG (25 Pa)		880 (1500)	1220 (2070)
0.2 - IN WG (50 Pa)		840 (1430)	1130 (1920)
0.3 - IN WG (75 Pa)		800 (1360)	1030 (1750)
0.4 - IN WG (100 Pa)		730 (1240)	920 (1560)
0.5 - IN WG (125 Pa)		650 (1100)	820 (1390)
Evaporator Air Flow - Wet Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		910 (1550)	1200 (2040)
0.1 - IN WG (25 Pa)		860 (1460)	1120 (1900)
0.2 - IN WG (50 Pa)		820 (1390)	1030 (1750)
0.3 - IN WG (75 Pa)		780 (1320)	940 (1600)
0.4 - IN WG (100 Pa)		710 (1210)	850 (1440)
0.5 - IN WG (125 Pa)		620 (1050)	750 (1270)
Evaporator			
Motor, hp (kW)		0.25 (0.19)	0.25 (0.19)
Filter Sizes - Quantity, in. (cm)		16 x 32.5 x 2 - one (40.6 x 82.5 x 5)	16 x 32.5 x 2 - one (40.6 x 82.5 x 5)
Drain Connection - ID, in.		3/4	3/4
Weight w/o Economizer, lb (kg)		330 (150)	330 (150)
Weight w/ Economizer, lb (kg)		350 (159)	350 (159)

* Based on rated airflow at 0.2 IN WG (50 Pa) external static and no outside air.

Table 11 Technical data, 60 Hz - High ambient condenser, continued

Model		ET048	ET060
Compressor Type		**Scroll**	**Scroll**
Net capacity data based on 80°F (26.6°C) DB/67°F (19.4°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	49200 (14.4)	59000 (17.3)
	Sensible	35800 (10.5)	39600 (11.6)
95°F (35.0°C)	Total	46900 (13.8)	55900 (16.4)
	Sensible	35000 (10.3)	38400 (11.3)
105°F (40.6°C)	Total	44400 (13.0)	52700 (15.5)
	Sensible	34100 (10.0)	37100 (10.9)
Net capacity data based on 75°F (23.9°C) DB/62.5°F (16.9°C) WB indoor ambient - BTUH (kW)*			
Outdoor ambient			
85°F (29.4°C)	Total	45500 (13.3)	54000 (15.8)
	Sensible	35400 (10.4)	38900 (11.4)
95°F (35.0°C)	Total	43400 (12.7)	51200 (15.0)
	Sensible	34500 (10.1)	37700 (11.1)
105°F (40.6°C)	Total	41100 (12.1)	48100 (14.1)
	Sensible	33600 (9.9)	36500 (10.7)
Evaporator Air Flow - Dry Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		2030 (3450)	2030 (3450)
0.1 - IN WG (25 Pa)		1910 (3240)	1910 (3240)
0.2 - IN WG (50 Pa)		1770 (3010)	1770 (3010)
0.3 - IN WG (75 Pa)		1650 (2800)	1650 (2800)
0.4 - IN WG (100 Pa)		1520 (2580)	1520 (2580)
0.5 - IN WG (125 Pa)		1390 (2360)	1390 (2360)
Evaporator Air Flow - Wet Coil			
External Static Pressure		**CFM (m^3/hr)**	**CFM (m^3/hr)**
0.0 - IN WG (0.0 Pa)		1800 (3060)	1800 (3060)
0.1 - IN WG (25 Pa)		1680 (2850)	1680 (2850)
0.2 - IN WG (50 Pa)		1580 (2680)	1580 (2680)
0.3 - IN WG (75 Pa)		1470 (2500)	1470 (2500)
0.4 - IN WG (100 Pa)		1360 (2310)	1360 (2310)
0.5 - IN WG (125 Pa)		1250 (2120)	1250 (2120)
Evaporator			
Motor, hp (kW)		0.50 (0.37)	0.50 (0.37)
Filter Sizes - Quantity, in. (cm)		21 x 36.25 x 2 - one (53.3 x 92 x 5)	21 x 36.25 x 2 - one (53.3 x 92 x 5)
Drain Connection - ID, in.		3/4	3/4
Weight - w/o Economizer, lb/kg		470 (213)	470 (213)
Weight - with Economizer, lb/kg		490 (222)	490 (222)

* Based on rated airflow at 0.2 IN WG (50 Pa) external static and no outside air.

Table 12 Technical data, 50 Hz - High ambient condenser

Model		**ET035**
Compressor type		**Scroll**
Net capacity data based on 26.6°C (80°F) DB/19.4°C (67°F) WB indoor ambient - kW (BTUH)*		
Outdoor ambient		
29.4°C (85°F)	Total	8.6 (29200)
	Sensible	6.3 (21600)
35.0°C (95°F)	Total	8.1 (27700)
	Sensible	6.2 (21100)
40.6°C (105°F)	Total	7.6 (26000)
	Sensible	6.0 (20500)
Net capacity data based on 23.9°C (75°F) DB 16.9°C (62.5°F) WB indoor ambient - kW (BTUH)*		
Outdoor ambient		
29.4°C (85°F)	Total	7.9 (27100)
	Sensible	6.3 (21400)
35.0°C (95°F)	Total	7.5 (25600)
	Sensible	6.1 (20800)
40.6°C (105°F)	Total	7.1 (24100)
	Sensible	5.9 (20200)
Evaporator Air Flow - Dry Coil		
External Static Pressure		**m^3/H (CFM)**
0.0 Pa (0.0 - IN WG)		1840 (1080)
25 Pa (0.1 - IN WG)		1730 (1020)
50 Pa (0.2 - IN WG)		1600 (940)
75 Pa (0.3 - IN WG)		1460 (860)
100 Pa (0.4 - IN WG)		—
125 Pa (0.5 - IN WG)		—
Evaporator Air Flow - Wet Coil		
External Static Pressure		**m^3/H (CFM)**
0.0 Pa (0.0 - IN WG)		1700 (1000)
25 Pa (0.1 - IN WG)		1590 (930)
50 Pa (0.2 - IN WG)		1460 (860)
75 Pa (0.3 - IN WG)		1330 (780)
100 Pa (0.4 - IN WG)		—
125 Pa (0.5 - IN WG)		—
Evaporator		
Motor, kW (hp)		0.19 (0.25)
Filter Sizes - Quantity, cm (in.)		16 x 32.5 x 2 - one (40.6 x 82.5 x 5)
Drain Connection - ID, in.		3/4 (1.9)
Weight - w/o Economizer, kg (lb)		150 (330)
Weight - with Economizer, kg (lb)		159 (350)

* Based on rated airflow at 50 Pa (0.2 IN WG) external static and no outside air.

Table 13 Technical data, 50 Hz - High ambient condenser, continued

Model		ET0477	ET059
Compressor type		**Scroll**	**Scroll**
Net capacity data based on 26.6°C (80°F) DB/19.4°C (67°F) WB indoor ambient - kW (BTUH)*			
Outdoor ambient			
29.4°C (85°F)	Total	12.1 (41400)	14.6 (50000)
	Sensible	8.8 (30000)	9.7 (33200)
35.0°C (95°F)	Total	11.5 (39500)	13.8 (47400)
	Sensible	8.6 (29300)	9.5 (32400)
40.6°C (105°F)	Total	10.9 (37400)	13.1 (44700)
	Sensible	8.4 (28600)	9.2 (31600)
Net capacity data based on 23.9°C (75°F) DB/16.9°C (62.5°F) WB indoor ambient - kW (BTUH)*			
Outdoor Ambient			
29.4°C (85°F)	Total	11.2 (38400)	13.4 (45800)
	Sensible	8.7 (29600)	9.6 (32700)
35.0°C (95°F)	Total	10.7 (36500)	12.7 (43600)
	Sensible	8.4 (28800)	9.3 (31700)
40.6°C (105°F)	Total	10.1 (34600)	12.2 (41600)
	Sensible	8.2 (28100)	9.0 (30900)
Evaporator Air Flow - Dry Coil			
External Static Pressure		**m^3/hr (CFM)**	**m^3/hr (CFM)**
0.0 Pa (0.0 - IN WG)		2870 (1690)	2870 (1690)
25 Pa (0.1 - IN WG)		2700 (1590)	2700 (1590)
50 Pa (0.2 - IN WG)		2500 (1470)	2500 (1470)
75 Pa (0.3 - IN WG)		2330 (1370)	2330 (1370)
100 Pa (0.4 - IN WG)		—	—
125 Pa (0.5 - IN WG)		—	—
Evaporator Air Flow - Wet Coil			
External Static Pressure		**m^3/hr (CFM)**	**m^3/hr (CFM)**
0.0 Pa (0.0 - IN WG)		2550 (1500)	2550 (1500)
25 Pa (0.1 - IN WG)		2380 (1400)	2380 (1400)
50 Pa (0.2 - IN WG)		2240 (1320)	2240 (1320)
75 Pa (0.3 - IN WG)		2070 (1220)	2070 (1220)
100 Pa (0.4 - IN WG)		—	—
125 Pa (0.5 - IN WG)		—	—
Evaporator			
Motor kW (hp)		0.37 (0.50)	0.37 (0.50)
Filter Sizes - Quantity cm (in.)		53.3 x 92 x 5 - one (21 x 36.25 x 2)	53.3 x 92 x 5 - one (21 x 36.25 x 2)
Drain Connection - ID, in.		3/4	3/4
Weight - w/o Economizer, kg (lb)		213 (470)	213 (470)
Weight - with Economizer, kg (lb)		222 (490)	222 (490)

* Based on rated airflow at 50 Pa (0.2 IN WG) external static and no outside air.

Table 14 Optional heater capacity, 60 Hz

Nominal Heater Rating	Heater Capacity - kW			
	2 Ton	3 Ton	4 Ton	5 Ton
5 kW				
Capacity @ 208V-1ph	3.756	3.756	3.756	3.756
Capacity @ 230V-1ph	4.592	4.592	4.592	4.592
Capacity @ 240V-1ph	5.000	5.000	5.000	5.000
Capacity @ 208V-3ph	3.756	3.756	3.756	3.756
Capacity @ 230V-3ph	4.592	4.592	4.592	4.592
Capacity @ 240V-3ph	5.000	5.000	5.000	5.000
Capacity @ 460V-3ph	4.592	4.592	4.592	4.592
Capacity @ 480V-3ph	5.000	5.000	5.000	5.000
10 kW				
Capacity @ 208V-1ph	7.511	7.511	7.511	7.511
Capacity @ 230V-1ph	9.184	9.184	9.184	9.184
Capacity @ 240V-1ph	10.000	10.000	10.000	10.000
Capacity @ 208V-3ph	7.511	7.511	7.511	7.511
Capacity @ 230V-3ph	9.184	9.184	9.184	9.184
Capacity @ 240V-3ph	10.000	10.000	10.000	10.000
Capacity @ 460V-3ph	9.184	9.184	9.184	9.184
Capacity @ 480V-3ph	10.000	10.000	10.000	10.000
15 kW				
Capacity @ 208V-1ph	n/a	11.267	11267	11267
Capacity @ 230V-1ph	n/a	13.776	13776	13776
Capacity @ 240V-1ph	n/a	15.000	15.000	15.000
Capacity @ 208V-3ph	n/a	11.267	11.267	11.267
Capacity @ 230V-3ph	n/a	13.776	13.776	13.776
Capacity @ 240V-3ph	n/a	15.000	15.000	15.000
Capacity @ 460V-3ph	n/a	13.776	13.776	13.776
Capacity @ 480V-3ph	n/a	15.000	15.000	15.000

Table 15 Optional heater capacity, 50 Hz

Nominal Heater Rating	Heater Capacity - kW		
	3 Ton	4 Ton	5 Ton
5 kW			
Capacity @ 220V-1ph	4.201	4.201	4.201
Capacity @ 240V-1ph	5.000	5.000	5.000
Capacity @ 200V-3ph	3.472	3.472	3.472
Capacity @ 230V-3ph	4.592	4.592	4.592
Capacity @ 240V-3ph	5.000	5.000	5.000
Capacity @ 380V-3ph	4.192	4.192	4.192
Capacity @ 415V-3ph	5.000	5.000	5.000
10 kW			
Capacity @ 220V-1ph	8.403	8.403	8.403
Capacity @ 240V-1ph	10.000	10.000	10.000
Capacity @ 200V-3ph	6.944	6.944	6.944
Capacity @ 230V-3ph	9.184	9.184	9.184
Capacity @ 240V-3ph	10.000	10.000	10.000
Capacity @ 380V-3ph	8.384	8.384	8.384
Capacity @ 415V-3ph	10.000	10.000	10.000
15 kW			
Capacity @ 220V-1ph	12.604	12.604	12.604
Capacity @ 240V-1ph	15.000	15.000	15.000
Capacity @ 200V-3ph	10.417	10.417	10.417
Capacity @ 230V-3ph	13.776	13.776	13.776
Capacity @ 240V-3ph	15.000	15.000	15.000
Capacity @ 380V-3ph	12.577	12.577	12.577
Capacity @ 415V-3ph	15.000	15.000	15.000

Table 16 Electrical data, 60 Hz - amps

			No Heat			5 kW Heat			10 kW Heat			15 kW Heat*					
												Circ1			Circ2		
Model	Volts	Phase	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
ET0187	208/230	1	14.5	17.2	25	23.4	29.3	30	44.4	55.5	60	NA	—	—	—	—	—
ET0247	208/230	1	15.2	18.1	30	23.4	29.3	30	44.4	55.5	60	NA	—	—	—	—	—
ET0247	208/230	3	12.4	14.6	20	14.4	18	20	26.4	33	35	NA	—	—	—	—	—
ET0247	460	3	5.9	6.9	15	7.3	9.1	15	13.3	16.6	20	NA	—	—	—	—	—
ET0367	208/230	1	20.9	25.2	40	23.4	29.3	40	44.4	55.5	60	44.4	55.5	60	21	26.3	30
ET0367	208/230	3	15.8	18.8	30	15.8	18.8	30	26.4	33	35	38.4	48	50	—	—	—
ET0367	460	3	8.4	10	15	8.4	10	15	13.3	16.6	20	19.3	24.1	25	—	—	—
ET0487	208/230	1	31.9	38	50	31.9	38	50	46.2	57.8	60	46.2	57.8	60	21	26.3	30
ET0487	208/230	3	24.7	29	35	24.7	29	35	28.2	35.3	35	40.2	50.3	60	—	—	—
ET0487	460	3	11.7	13.7	20	11.7	13.7	20	14.1	17.6	20	20.1	25.1	30	—	—	—
ET0607	208/230	1	37.7	45.2	60	37.7	45.2	60	46.2	57.8	60	46.2	57.8	60	21	26.3	30
ET0607	208/230	3	28.3	33.5	50	28.3	33.5	50	28.3	35.3	50	40.2	50.3	50	—	—	—
ET0607	460	3	13.8	16.3	25	13.8	16.3	25	14.1	17.6	25	20.1	25.1	30	—	—	—

* 15 kW heat option @ 208/230 - 1 phase requires two electrical feeds.
Circuit 1 supplies the compressor, condenser, 10 kW heat and the evaporator motor.
Circuit 2 supplies the remaining 5 kW heat.

Table 17 Electrical data, 50 Hz - amps

			No Heat			5 kW Heat			10 kW Heat			15 kW Heat*					
												Circ1			Circ2		
Model	Volts	Phase	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
ET0357	220/240	1	18.1	21.7	35	23.4	29.3	35	44.4	55.5	60	44.4	55.5	60	21	26.3	30
ET0357	200/230	3	15.8	18.8	25	15.8	18.8	25	26.4	33	35	38.4	48	50	—	—	—
ET0357	380/415	3	8.4	10.0	15	8.4	10.0	15	15.3	19.1	20	22.3	27.9	30	—	—	—
ET0477	200/230	3	23.3	27.2	35	23.3	27.2	35	28.2	35.3	35	40.2	50.3	60	—	—	—
ET0477	380/415	3	11.7	13.7	20	11.7	13.7	20	16.1	20.1	25	23.1	28.9	30	—	—	—
EF0597	200/230	3	28.3	33.5	50	28.3	33.5	50	28.3	35.3	50	40.2	50.3	50	—	—	—
ET0597	380/415	3	13.8	16.3	25	13.8	16.3	25	16.1	20.1	25	23.1	28.9	30	—	—	—

* 15 kW heat option @ 220/240 - 1 phase requires two electrical feeds.
Circuit 1 supplies the compressor, condenser, 10 kW heat and the evaporator motor.
Circuit 2 supplies the remaining 5 kW heat.

8.0 TROUBLESHOOTING

Table 18 Troubleshooting guide

Problem	Probable Cause	Remedy
Unit will not start	No power to unit	Check voltage to input circuit breaker.
	Control voltage circuit breaker open	Locate short and reset breaker.
	Shut off by external thermostat or stat is defective	Check operation of thermostat.
No cooling	Low refrigerant charge	Check with gauges.
	Compressor contactor not pulling in	Check voltage at contactor. If not present refer to print and determine voltage loss. Check enthalpy sensor for full CCW or D setting.
	No output from thermostat	Check operation of stat. Should have voltage output to Y terminal during cooling.
Unit cycles on high pressure switch	Loss or restriction of airflow	Check condenser blower assembly for proper operation. Check for dirty coil or inlet grille restriction.
	Defective fan cycling control	Switch should make @ 240 PSIG ±10 (1655 kPa ±68.9). (Check settings on adjustable switch when supplied.)
Heat does not operate	No voltage output from thermostat	Check stat for proper output to W terminal.
	Fusible link blown	Check for open and replace.
	Bad contactor	Check for open and replace.

9.0 MAINTENANCE INSPECTION CHECKLIST

Date:_____ Prepared by:_____

Model #:_____ Serial #: _____

Monthly

Filters

___ 1. Unrestricted air flow

___ 2. Check filter

___ 3. Wipe section clean

Fan Section

___ 1. Impellers free of debris

___ 2. Bearings free

Economizer

___ 1. Check damper for tightness and wear

Semiannually

Compressor Section

___ 1. Check for leaks

___ 2. Vibration isolation

Air Cooled Condenser

___ 1. Condenser coil clean

___ 2. Motor mount tight

___ 3. Bearings free

___ 4. Refrigerant lines properly supported

Refrigeration Cycle

___ 1. Check suction pressure

___ 2. Check head pressure

___ 3. Check superheat

___ 4. Evaporator coil clean

___ 5. Insulation intact

Electric Panel

___ 1. Check electrical connections

___ 2. Check operational sequences

Drain Piping

___ 1. Check for obstructions.

___ 2. Check for leaks and damage.

Notes:

Signature _____

Make photocopies of this form for your records

10.0 PARTS

Table 19 Refrigeration system parts, 1.5 and 2 ton units

Figure No.	Part Name/ Description	Part #	1.5 Ton		2 Ton				
			ET017S	ET018P	ET023S	ET023M	ET024P	ET024Y	ET024A
			220-240V 1Ph 50Hz	208-230V 1Ph 60Hz	220-240V 1Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
	Run capacitor, scroll compressor								
7-7	Cap. 30µF, 370V	1A19537P1		1		N/A		N/A	N/A
7-7	Cap. 40µF, 370V	1A19538P1	1		1	N/A	1	N/A	N/A
	Compressors, scroll								
7-6	Comp. 220/240-1	156204P1	1						
7-6	Comp. 200/230-1	159146P1		1					
7-6	Comp. 220/240-1	138493P2			1				
7-6	Comp. 380/460-3	148324P2				1			
7-6	Comp. 200/230-1	159145P1					1		
7-6	Comp. 208/230-3	159148P1						1	
7-6	Comp. 380/460-3	159148P2							1
	Pressure switches								
	High pressure - 400 psi	159482P1	1	1	1	1	1	1	1
	Fan cycle switch - 170 psi	159483P1	Optional feature - quantity 1 (as required)						
	Low pressure - 35 psi	159484P1	Optional feature - quantity 1 (as required)						
	Adj Pr Sw for Adj FCC	P67-0110	Optional feature - quantity 1 (as required)						
	Filter drier	127185P1	1	1	1	1	1	1	1
7-10	Condenser coil-1.5/3T	159118P1	1	1	1	1	1	1	1
9-1	Evaporator coil-1.5/2T	159200P1	1	1	1	1	1	1	1
9-1	Thermal expansion valve-1.5T	1C19507P3	1	1					
9-1	Thermal expansion valve-2T	1C19507P1			1	1	1	1	1
	Crankcase heaters								
7-9	Strap style 240V recips	159202P1	1	1	1		1	1	
7-9	Strap style 480V recips	159202P2				1			1
	Retainer plug	159136P1	1	1	1	1	1	1	1
14-1	Soft start kit	1C19540P1	Optional feature - quantity 1 (as required)						

Table 20 Refrigeration system parts, 3 ton units

Figure No.	Part Name/ Description	Part #	3 Ton					
			ET035S	ET035N	ET035M	ET036P	ET036Y	ET036A
			220-240V 1Ph 50Hz	200-240V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
	Compressors, scroll							
7-6	Comp. 220/240-1	148221P2	1					
7-6	Comp. 208/230-3	148325P1		1			1	
7-6	Comp. 380/460-3	148325P2			1			1
7-6	Comp. 200/230-1	159149P1				1		
	Pressure switches							
	High pressure - 400 psi	159482P1	1	1	1	1	1	1
	Fan cycle switch - 170 psi	159483P1	Optional feature—quantity 1 (as required)					
	Low pressure - 35 psi	159484P1	Optional feature—quantity 1 (as required)					
	Adj Pr Sw for Adj FCC	P67-0110	Optional feature—quantity 1 (as required)					
	Filter drier	127185P1	1	1	1	1	1	1
7-10	Condenser coil - 1.5/3T	159118P1	1	1	1	1	1	1
9-1	Evaporator coil - 3T	159180P1	1	1	1	1	1	1
9-1	Thermal expansion valve - 3T	1C19507P2	1	1	1	1	1	1
	Crankcase Heaters							
7-9	Strap style 240V scrolls	132102P1	1	1		1	1	
7-9	Strap style 480V scrolls	132102P2			1			1
	Retainer plug	159136P1	1	1	1	1	1	1
14-1	Soft start kit	1C19540P1	Optional feature—quantity 1 (as required)					

Table 21 Refrigeration system parts, 4-ton units

Figure No.	Part Name/ Description	Part #	4 Ton				
			ET047N ET347N	ET047M ET347M	ET048P ET348P	ET048Y ET348Y	ET048A ET348A
			200-230V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
	Run capacitor, scroll compressor						
7-7	Cap. 40µF, 370V	1A19538P1	N/A	N/A	1	N/A	N/A
	Compressors, scroll						
7-6	Comp. 208/230-3	159153P1	1			1	
7-6	Comp. 380/460-3	159153P2		1			1
7-6	Comp. 200/230-1	159152P1			1		
	Pressure switches						
	High pressure - 400 psi	159482P1	1	1	1	1	1
	Fan cycle switch - 170 psi	159483P1	Optional feature - quantity 1 (as required)				
	Low Pressure - 35 psi	159484P1	Optional feature - quantity 1 (as required)				
	Adj Pr Sw for Adj FCC	P67-0110	Optional feature - quantity 1 (as required)				
	Filter drier	128177P1	1	1	1	1	1
7-10	Condenser coil - 4/5T	159235P1	1	1	1	1	1
9-1	Evaporator coil - 4/5T	159237P1	1	1	1	1	1
9-1	Thermal expansion valve - 4T	159264P1	1	1	1	1	1
	Crankcase heaters						
7-9	Strap style 240V scrolls	132102P1	1		1	1	
7-9	Strap style 480V scrolls	132102P2		1			1
14-1	Soft start kit	1C19540P1	Optional feature - quantity 1 (as required)				

Table 22 Refrigeration system parts, 5-ton units

Figure No.	Part Name/ Description	Part #	5 Ton				
			ET059N ET359N	ET059M ET359M	ET060P ET360P	ET060Y ET360Y	ET060A ET360Y
			200-230V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60	460V 3Ph 60Hz
	Run capacitor, scroll compressor						
7-7	Cap. 60µF, 370V	E13-2430	N/A	N/A	1	N/A	N/A
	Compressors, scroll						
7-6	Comp. 200/240-3	132101P2	1			1	
7-6	Comp. 380/460-3	132101P3		1			1
7-6	Comp. 200/230-1	132101P1			1		
	Pressure switches						
	High pressure - 400 psi	159482P1	1	1	1	1	1
	Fan cycle switch - 170 psi	159483P1	Optional feature - quantity 1 (as required)				
	Low Pressure - 35 psi	159484P1	Optional feature - quantity 1 (as required)				
	Adj Pr Sw for Adj FCC	P67-0110	Optional feature - quantity 1 (as required)				
	Filter drier	128177P1	1	1	1	1	1
7-10	Condenser coil - 4/5T	159235P1	1	1	1	1	1
9-1	Evaporator coil - 4/5T	159237P1	1	1	1	1	1
9-1	Thermal expansion valve - 5T	159264P2	1	1	1	1	1
	Crankcase heaters						
7-9	Strap style 240V scrolls	132102P1	1		1	1	
7-9	Strap style 480V scrolls	132102P2		1			1
14-1	Soft start kit	1C19540P1	Optional feature - quantity 1 (as required)				

Table 23 Electric panel, 1.5- and 2-ton units

Figure No.	Part Name / Description	Part #	1.5 Ton		2 Ton				
			ET017S	ET018P	ET023S	ET023M	ET024P	ET024Y	ET024A
			220-240V 1Ph 50Hz	208-230V 1Ph 60Hz	220-240V 1Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
10-3	Transformer 208/230V	159463P1	1	1	1		1	1	
10-3	Transformer 360/460V	159463P2				1			1
	Circuit breakers								
10-1	No heat		138457P7	138457P3	138457P3	147957P8	138457P3	147957P7	147957P8
10-1	5 kW heat		138457P5	138457P5	138457P5	147957P8	138457P5	147957P7	147957P8
10-1	10 kW heat		138457P2	138457P2	138457P2	147957P1	138457P2	147957P10	147957P1
10-1	15 kW heat		N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-1A	Heater breaker		N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Circuit breakers - scrolls								
10-1	No heat		138457P3	138457P3	138457P5	147957P8	138457P5	147957P7	147957P8
10-1	5 kW heat		138457P5	138457P5	138457P5	147957P8	138457P5	147957P7	147957P8
10-1	10 kW heat		138457P2	138457P2	138457P2	147957P1	138457P2	147957P10	147957P1
10-1	15 kW heat		N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-1A	Heater breaker		N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Contactor, compressor								
10-4	2 pole	E-013A	1	1	1		1		
10-4	3 pole	124501P1				1		1	1
	Contactor, heater, 5 kW								
10-9	2 pole	E-013A	1	1	1		1		
10-9	3 pole	124501P1				1		1	1
	Contactor, heater, 10 kW								
10-9	2 pole	E-011C	1	1	1		1		
10-9	3 pole	124501P1				1			1
10-9	3 pole	E-0110						1	
10-6	Contactor evaporator fan	E-0130	1	1	1		1	1	
10-6	Contactor evaporator fan	E-013A				1			1
10-7	Contactor, condenser fan	E-013A				1			1
10-8	Time delay relay, anticycle	148089P1	1	1	1	1	1	1	1
10-16	Heater interlock relay	E03-0170				1			1
10-10	Terminal strip, 10 position	159468P1	1	1	1	1	1	1	1
	Wall thermostat, 1 stage	138968P1	1	1	1	1	1	1	1
	Thermostat base	138940P1	1	1	1	1	1	1	1
	Optional features								
10-13	Time delay relay, LP bypass	138491P1	Optional feature - quantity 1 (as required)						
10-12	Economizer relay	E03-0170	Optional feature - quantity 1 (as required)						
10-11	Lockout relay	E-0130	Optional feature - quantity 1 (as required)						
	Common alarm assembly								
13-1	Airflow switch	B02-0190	Optional feature - quantity 1 (as required)						
13-2	T/D relay	E-3530	Optional feature - quantity 1 (as required)						
13-3	Relay R1	E03-0170	Optional feature - quantity 1 (as required)						
13-4	Relay R2	E03-0170	Optional feature - quantity 1 (as required)						
13-5	Thermostat	E-0230	Optional feature - quantity 1 (as required)						

Table 24 Electric panel parts, 3-ton units

Figure No.	Part Name / Description	Part #	3 Ton					
			ET035S	ET035N	ET035M	ET036P	ET036Y	ET036A
			220-240V 1Ph 50Hz	200-240V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz 3	460V 3Ph 60Hz
10-3	Transformer 208/230V	159463P1	1	1		1	1	
10-3	Transformer 360/460V	159463P2			1			1
	Circuit breakers							
10-1	No heat		138457P1	147957P5	147957P8	138457P8	147957P5	147957P8
10-1	5 kW heat		138457P1	147957P5	147957P8	138457P8	147957P5	147957P8
10-1	10 kW heat		138457P2	147957P10	147957P1	138457P2	147957P10	147957P1
10-1	15 kW heat		138457P2	147957P3	147957P2	138457P2	147957P3	147957P11
10-1A	Heater breaker		138457P5	N/A	N/A	138457P5	N/A	N/A
	Circuit breakers - scrolls							
10-1	No heat		138457P9	147957P9	147957P8	138457P1	147957P5	147957P8
10-1	5 kW heat		138457P9	147957P9	147957P8	138457P1	147957P5	147957P8
10-1	10 kW heat		138457P2	147957P10	147957P1	138457P2	147957P10	147957P1
10-1	15 kW heat		138457P2	147957P3	147957P2	138457P2	147957P3	147957P11
10-1A	Heater breaker		138457P5	N/A	N/A	138457P5	N/A	N/A
	Contactor, compressor							
10-4	2 pole	E-011B	1			1		
10-4	3 pole	124501P1			1			1
10-4	3 pole	E-0110		1			1	
	Contactor, heater, 5 kW							
10-9	2 pole	E-013A	1			1		
10-9	3 pole	124501P1		1	1		1	1
	Contactor, heater, 10 kW							
10-9	2 pole	E-011C	1			1		
10-9	3 pole	124501P1			1			1
10-9	3 pole	E-0110		1			1	
	Contactor, heater, 15 kW							
10-15	2 pole	E-013A	1			1		
10-9	2 pole	E-011C	1			1		
10-9	3 pole	E-0110			1			1
10-9	3 pole	E-009F		1			1	
10-6	Contactor evaporator fan	E-0130	1	1		1	1	
10-6	Contactor evaporator fan	E-013A			1			1
10-7	Contactor, condenser fan	E-013A			1			1
10-8	Time delay relay, anticycle	148089P1	1	1	1	1	1	1
10-16	Heater interlock relay	E03-0170			1			1
10-10	Terminal strip, 10 position	159468P1	1	1	1	1	1	1
	Wall thermostat, 1 stage	138968P1	1	1	1	1	1	1
	Thermostat base	138940P1	1	1	1	1	1	1
	Optional features							
10-13	Time delay relay, LP bypass	138491P1	Optional feature - quantity 1 (as required)					
10-12	Economizer relay	E03-0170	Optional feature - quantity 1 (as required)					
10-11	Lockout relay	E-0130	Optional feature - quantity 1 (as required)					
	Common alarm assembly							
13-1	Air flow switch	B02-0190	Optional feature - quantity 1 (as required)					
13-2	T/D relay	E-3530	Optional feature - quantity 1 (as required)					
13-3	Relay R1	E03-0170	Optional feature - quantity 1 (as required)					
13-4	Relay R2	E03-0170	Optional feature - quantity 1 (as required)					
13-5	Thermostat	E-0230	Optional feature - quantity 1 (as required)					

Table 25 Electric panel parts, 4-ton unit

Figure No.	Part Name / Description	Part #	4 Ton				
			ET047N ET347N	ET047M ET347M	ET048P ET348P	ET048Y ET348Y	ET048A ET348A
			200-230V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
10-3	Transformer 208/230V	159463P1	1		1	1	
10-3	Transformer 360/460V	159463P2		1			1
	Circuit breakers - scrolls						
10-1	No heat		147957P10	147957P1	138457P4	147957P10	147957P1
10-1	5 kW heat		147957P10	147957P1	138457P4	147957P10	147957P1
10-1	10 kW heat		147957P10	147957P11	138457P2	147957P10	147957P1
10-1	15 kW heat		147957P6	147957P2	138457P2	147957P6	147957P2
10-1A	Heater breaker		N/A	N/A	138457P5	N/A	N/A
	Contactor, compressor						
10-4	2 pole	E-011C			1		
10-4	3 pole	124501P1		1			1
10-4	3 pole	E-0110	1			1	
	Contactor, heater, 5 kW						
10-9	2 pole	E-013A	1		1		
10-9	3 pole	124501P1		1		1	1
	Contactor, heater, 10 kW						
10-9	2 pole	E-011C	1		1		
10-9	3 pole	124501P1		1			1
10-9	3 pole	E-0110				1	
	Contactor, heater, 15 kW						
10-15	2 pole	E-013A			1		
10-9	2 pole	E-011C			1		
10-9	3 pole	E-0110		1			1
10-9	3 pole	E-009F	1			1	
10-6	Contactor evaporator fan	E-0130	1		1	1	
10-6	Contactor evaporator fan	E-013A		1			1
10-7	Contactor, condenser fan	E-013A		1			1
10-8	Time delay relay, anticycle	148089P1	1	1	1	1	1
10-16	Heater interlock relay	E03-0170		1			1
10-10	Terminal strip, 10 position	159468P1	1	1	1	1	1
	Wall thermostat, 1 stage	138968P1	1	1	1	1	1
	Thermostat base	138940P1	1	1	1	1	1
	Optional features						
10-13	Time delay relay, LP bypass	138491P1	Optional feature - quantity 1 (as required)				
10-12	Economizer relay	E03-0170	Optional feature - quantity 1 (as required)				
10-11	Lockout relay	E-0130	Optional feature - quantity 1 (as required)				
	Common alarm assembly						
13-1	Air flow switch	B02-0190	Optional feature - quantity 1 (as required)				
13-2	T/D relay	E-3530	Optional feature - quantity 1 (as required)				
13-3	Relay R1	E03-0170	Optional feature - quantity 1 (as required)				
13-4	Relay R2	E03-0170	Optional feature - quantity 1 (as required)				
13-5	Thermostat	E-0230	Optional feature - quantity 1 (as required)				

Table 26 Electric panel parts, 5-ton unit

Figure No.	Part Name / Description	Part #	5 Ton				
			ET059N ET359N	ET059M ET359M	ET060P ET360P	ET060Y ET360Y	ET060A ET360Y
			200-230V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
10-3	Transformer 208/230V	159463P1	1		1	1	
10-3	Transformer 360/460V	159463P2		1			1
	Circuit breakers - scrolls						
10-1	No heat		147957P3	147957P11	138457P2	147957P3	147957P11
10-1	5 kW heat		147957P3	147957P11	138457P2	147957P3	147957P11
10-1	10 kW heat		147957P3	147957P11	138457P2	147957P3	147957P11
10-1	15 kW heat		147957P3	147957P2	138457P2	147957P3	147957P2
10-1A	Heater breaker		N/A	N/A	138457P5	N/A	N/A
	Contactor, compressor						
10-4	2 pole	E-011C			1		
10-4	3 pole	124501P1		1			1
10-4	3 pole	E-0110	1			1	
	Contactor, heater, 5 kW						
10-9	2 pole	E-013A			1		
10-9	3 pole	124501P1	1	1		1	1
	Contactor, heater, 10 kW						
10-9	2 pole	E-011C			1		
10-9	3 pole	124501P1		1			1
10-9	3 pole	E-0110	1			1	
	Contactor, heater, 15 kW						
10-15	2 pole	E-013A			1		
10-9	2 pole	E-011C			1		
10-9	3 pole	E-0110		1			1
10-9	3 pole	E-009F	1			1	
10-6	Contactor evaporator fan	E-0130	1		1	1	
10-6	Contactor evaporator fan	E-013A		1			1
10-7	Contactor, condenser fan	E-013A		1			1
10-8	Time delay relay, anticycle	148089P1	1	1	1	1	1
10-16	Heater interlock relay	E-0130		1			1
10-10	Terminal strip, 10 position	159468P1	1	1	1	1	1
	Wall thermostat, 1 stage	138968P1	1	1	1	1	1
	Thermostat base	138940P1	1	1	1	1	1
	Optional features						
10-13	Time delay relay, LP bypass	138491P1	Optional feature - quantity 1 (as required)				
10-12	Economizer relay	E03-0170	Optional feature - quantity 1 (as required)				
10-11	Lockout relay	E-0130	Optional feature - quantity 1 (as required)				
	Common alarm assembly						
13-1	Air flow switch	B02-0190	Optional feature - quantity 1 (as required)				
13-2	T/D relay	E-3530	Optional feature - quantity 1 (as required)				
13-3	Relay R1	E03-0170	Optional feature - quantity 1 (as required)				
13-4	Relay R2	E03-0170	Optional feature - quantity 1 (as required)				
13-5	Thermostat	E-0230	Optional feature - quantity 1 (as required)				

Table 27 Motor parts, heater, Economizer, 1.5- and 2-ton units

Figure No.	Part Name/ Description	Part #	1.5 Ton		2 Ton				
			ET017S	ET018P	ET023S	ET023M	ET024P	ET024Y	ET024A
			220-240V 1Ph 50Hz	208-230V 1Ph 60Hz	220-240V 1Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
	Condenser fan motors								
	Standard								
7-1	Motor 1/8 hp, 208/230V (std)	159206P1	1	1	1		1	1	
7-1	Motor 1/8 hp, 380/460V (std)	159206P2				1			1
7-2	Fan prop, 2 blade, 20", 28-deg	159189P2	1	1	1	1	1	1	1
	High ambient option								
7-1	1/5 hp, 208/230V (high amb)	159205P1	1	1	1		1	1	
7-1	1/5 hp, 380/460V (high amb)	159205P2				1			1
7-2	Fan prop, 4 blade, 20", 22-deg	159112P1	1	1	1	1	1	1	1
7-8	Capacitor, run 5µF, 370V	B-1220	1	1	1	1	1	1	1
7-4	Motor mount	159175P1	1	1	1	1	1	1	1
	Evaporator fan motors								
8-11	Motor 1/4 hp dual 206/230V	159207P1	1	1	1		1	1	
8-11	Motor 1/4 hp dual 380/460V	159207P2				1			1
8-2	Blower, CW	159201P2	1	1	1	1	1	1	1
8-1	Blower, CCW	159201P1	1	1	1	1	1	1	1
8-3	Capacitor, run 5µF, 370V	B-1220	1	1	1	1	1	1	1
8-8	Motor mount	159174P1	1	1	1	1	1	1	1
8-9	Mount bolt	100061	1	1	1	1	1	1	1
8-10	Mount nut	S-3380	1	1	1	1	1	1	1
8-4	Grommet washer	127843P1	4	4	4	4	4	4	4
8-5	Screw	147993P1	4	4	4	4	4	4	4
8-6	Grommet tube	127843P2	4	4	4	4	4	4	4
8-7	Spacing sleeve	127843P3	4	4	4	4	4	4	4
	Heaters - optional								
11-1	Heater element, 5kW, 240V	159170P1	1	1	1	1	1	1	
11-1	Heater element, 5kW, 277V	159170P2							1
11-1	Heater element, 10kW, 240V	159170P3	1	1	1	1	1	1	
11-1	Heater element, 10kW, 277V	159170P4							1
11-1	Heater element, 15kW, 240V	159170P5	1	1	1	1	1	1	
11-1	Heater element, 15kW, 277V	159170P6							1
11-1	Fuse link, safety	147896P1	3	3	3	3	3	3	3
11-1	Therm switch, safety (5kW)	R-013A	1	1	1	1	1	1	1
11-1	Thermswitch, safety (10, 15kW)	R-013B	1	1	1	1	1	1	1
11-1	Jumper wire	146807G1	4	4	4	2	4	3	2
	Economizer - optional								
12-1	Actuator motor, spring return	159115P1	Optional feature - quantity 1 (as required)						
12-2	Min position potentiometer	159471P1	Optional feature - quantity 1 (as required)						
12-3	Enthalpy control	138401P1	Optional feature - quantity 1 (as required)						
12-4	Mixed air sensor	159204P1	Optional feature - quantity 1 (as required)						
12-5	Push rod	159137P1	Optional feature - quantity 1 (as required)						
12-6	Linkage, ball type	129645P1	Optional feature - quantity 1 (as required)						
12-7	Filter, 2" x 16" x 32.5"	138447P2	1	1	1	1	1	1	1

Table 28 Motor parts, heater, Economizer, 3-ton units

Figure No.	Part Name/ Description	Part #	3 Ton					
			ET035S	ET035N	ET035M	ET036P	ET036Y	ET036A
			220-240V 1Ph 50Hz	200-240V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz 3	460V 3Ph 60Hz
	Condenser fan motors							
	Standard							
7-1	Motor 1/8 hp, 208/230V (std)	159206P1	1	1		1	1	
7-1	Motor 1/8 hp, 380/460V (std)	159206P2			1			1
7-2	Fan prop, 4 blade, 20", 26-deg	159112P2	1	1	1	1	1	1
	High ambient option							
7-1	1/5 hp, 208/230V (high amb)	159205P1	1	1		1	1	
7-1	1/5 hp, 380/460V (high amb)	159205P2			1			1
7-2	Fan prop, 4 blade, 20", 22-deg	159112P1	1	1	1	1	1	1
7-8	Capacitor, run 5µF, 370V	B-1220	1	1	1	1	1	1
7-4	Motor mount	159175P1	1	1	1	1	1	1
	Evaporator fan motors							
8-11	Motor 1/4 hp dual 206/230V	159207P1	1	1		1	1	
8-11	Motor 1/4 hp dual 380/460V	159207P2			1			1
8-2	Blower, CW	159201P2	1	1	1	1	1	1
8-1	Blower, CCW	159201P1	1	1	1	1	1	1
8-3	Capacitor, run 5µF, 370V	B-1220	1	1	1	1	1	1
8-8	Motor mount	159174P1	1	1	1	1	1	1
8-9	Mount bolt	100061	1	1	1	1	1	1
8-10	Mount nut	S-3380	1	1	1	1	1	1
8-4	Grommet washer	127843P1	4	4	4	4	4	4
8-5	Screw	147993P1	4	4	4	4	4	4
8-6	Grommet tube	127843P2	4	4	4	4	4	4
8-7	Spacing sleeve	127843P3	4	4	4	4	4	4
	Heaters - optional							
11-1	Heater element, 5kW, 240V	159170P1	1	1	1	1	1	
11-1	Heater element, 5kW, 277V	159170P2						1
11-1	Heater element, 10kW, 240V	159170P3	1	1	1	1	1	
11-1	Heater element, 10kW, 277V	159170P4						1
11-1	Heater element, 15kW, 240V	159170P5	1	1	1	1	1	
11-1	Heater element, 15kW, 277V	159170P6						1
11-1	Fuse link, safety	147896P1	3	3	3	3	3	3
11-1	Therm switch, safety (5kW)	R-013A	1	1	1	1	1	1
11-1	Therm switch, safety (10,15kW)	R-013B	1	1	1	1	1	1
11-1	Jumper wire	146807G1	4	3	2	4	3	2
	Economizer - optional							
12-1	Actuator motor, spring return	159115P1	Optional feature - quantity 1 (as required)					
12-2	Min position potentiometer	159471P1	Optional feature - quantity 1 (as required)					
12-3	Enthalpy control	138401P1	Optional feature - quantity 1 (as required)					
12-4	Mixed air sensor	159204P1	Optional feature - quantity 1 (as required)					
12-5	Push rod	159137P1	Optional feature - quantity 1 (as required)					
12-6	Linkage, ball type	129645P1	Optional feature - quantity 1 (as required)					
12-7	Filter, 2" x 16" x 32.5"	138447P2	1	1	1	1	1	1

Table 29 Motor parts, heater, Economizer, 4-ton units

Figure No.	Part Name/ Description	Part #	4 Ton				
			ET047N ET347N	ET047M ET347M	ET048P ET348P	ET048Y ET348Y	ET048A ET348A
			200-230V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60Hz	460V 3Ph 60Hz
	Condenser fan motors						
	Standard						
7-1	Motor 1/3 hp, 200/240V (std)	159266P1	1		1	1	
7-1	Motor 1/3 hp, 380/460V (std)	159266P2		1			1
7-2	Fan prop, 4 blade, 24", 28-deg	159241P2	1	1	1	1	1
	High ambient option						
7-1	1/2 hp, 200/240V (high amb)	159265P1	1		1	1	
7-1	1/2 hp, 380/460V (high amb)	159265P2		1			1
7-2	Fan prop, 4 blade, 24", 24-deg	159241P1	1	1	1	1	1
7-8	Capacitor, run 10µF, 370V	B03-0030	1	1	1	1	1
7-4	Motor mount	159175P1	1	1	1	1	1
	Evaporator fan motors						
8-11	Motor 1/2 hp dual 200/230V	159267P1	1		1	1	
8-11	Motor 1/2 hp dual 380/460V	159267P2		1			1
8-2	Blower, CW	159254P2	1	1	1	1	1
8-1	Blower, CW	159254P1	1	1	1	1	1
8-3	Capacitor, run 10µF, 370V	B03-0030	1	1	1	1	1
8-8	Motor mount	159263P1	1	1	1	1	1
8-9	Mount bolt	100061	1	1	1	1	1
8-10	Mount nut	S-3380	1	1	1	1	1
8-4	Grommet washer	127843P1	6	6	6	6	6
8-5	Screw	147993P1	6	6	6	6	6
8-6	Grommet tube	127843P2	6	6	6	6	6
8-7	Spacing sleeve	127843P3	6	6	6	6	6
	Heaters - optional						
11-1	Heater element, 5kW, 240V	159170P1	1	1	1	1	
11-1	Heater element, 5kW, 277V	159170P2					1
11-1	Heater element, 10kW, 240V	159170P3	1	1	1	1	
11-1	Heater element, 10kW, 277V	159170P4					1
11-1	Heater element, 15kW, 240V	159170P5	1	1	1	1	
11-1	Heater element, 15kW, 277V	159170P6					1
11-1	Fuse link, safety	147896P1	3	3	3	3	3
11-1	Therm switch, safety (5kW)	R-013A	1	1	1	1	1
11-1	Therm switch, safety (10,15kW)	R-013B	1	1	1	1	1
11-1	Jumper wire	146807G1	3	2	4	3	2
	Economizer - optional						
12-1	Actuator motor, spring return	159115P1	Optional feature - quantity 1 (as required)				
12-2	Min position potentiometer	159471P1	Optional feature - quantity 1 (as required)				
12-3	Enthalpy control	138401P1	Optional feature - quantity 1 (as required)				
12-4	Mixed air sensor	159204P1	Optional feature - quantity 1 (as required)				
12-5	Push rod	159137P1	Optional feature - quantity 1 (as required)				
12-6	Linkage, ball type	129645P1	Optional feature - quantity 1 (as required)				
12-7	Filter, 2" x 21" x 36.25"	138447P3	1	1	1	1	1

Table 30 Motor parts, heater, Economizer, 5-ton units

Figure No.	Part Name/ Description	Part #	5 Ton				
			ET059N ET359N	ET059M ET359M	ET060P ET360P	ET060Y ET360Y	ET060A ET360Y
			200-230V 3Ph 50Hz	380-415V 3Ph 50Hz	208-230V 1Ph 60Hz	208-230V 3Ph 60	460V 3Ph 60Hz
	Condenser fan motors						
	Standard						
7-1	Motor 1/3 hp, 200/240V (std)	159266P1	1		1	1	
7-1	Motor 1/3 hp, 380/460V (std)	159266P2		1			1
7-2	Fan prop, 4 blade, 24", 28-deg	159241P2	1	1	1	1	1
	High ambient option						
7-1	1/2 hp, 200/240V (high amb)	159265P1	1		1	1	
7-1	1/2 hp, 380/460V (high amb)	159265P2		1			1
7-2	Fan prop, 4 blade, 24", 24-deg	159241P1	1	1	1	1	1
7-8	Capacitor, run 10µF, 370V	B03-0030	1	1	1	1	1
7-4	Motor mount	159175P1	1	1	1	1	1
	Evaporator fan motors						
8-11	Motor 1/2 hp dual 200/230V	159267P1	1		1	1	
8-11	Motor 1/2 hp dual 380/460V	159267P2		1			1
8-2	Blower, CW	159254P2	1	1	1	1	1
8-1	Blower, CW	159254P1	1	1	1	1	1
8-3	Capacitor, run 10µF, 370V	B03-0030	1	1	1	1	1
8-8	Motor mount	159263P1	1	1	1	1	1
8-9	Mount bolt	100061	1	1	1	1	1
8-10	Mount nut	S-3380	1	1	1	1	1
8-4	Grommet washer	127843P1	6	6	6	6	6
8-5	Screw	147993P1	6	6	6	6	6
8-6	Grommet tube	127843P2	6	6	6	6	6
8-7	Spacing sleeve	127843P3	6	6	6	6	6
	Heaters - optional						
11-1	Heater element, 5kW, 240V	159170P1	1	1	1	1	
11-1	Heater element, 5kW, 277V	159170P2					1
11-1	Heater element, 10kW, 240V	159170P3	1	1	1	1	
11-1	Heater element, 10kW, 277V	159170P4					1
11-1	Heater element, 15kW, 240V	159170P5	1	1	1	1	
11-1	Heater element, 15kW, 277V	159170P6					1
11-1	Fuse link, safety	147896P1	3	3	3	3	3
11-1	Therm switch, safety (5kW)	R-013A	1	1	1	1	1
11-1	Therm switch, safety (10,15kW)	R-013B	1	1	1	1	1
11-1	Jumper wire	146807G1	3	2	4	3	2
	Economizer - optional						
12-1	Actuator motor, spring return	159115P1	Optional feature - quantity 1 (as required)				
12-2	Min position potentiometer	159471P1	Optional feature - quantity 1 (as required)				
12-3	Enthalpy control	138401P1	Optional feature - quantity 1 (as required)				
12-4	Mixed air sensor	159204P1	Optional feature - quantity 1 (as required)				
12-5	Push rod	159137P1	Optional feature - quantity 1 (as required)				
12-6	Linkage, ball type	129645P1	Optional feature - quantity 1 (as required)				
12-7	Filter, 2" x 21" x 36.25"	138447P3	1	1	1	1	1

Figure 7 Condenser/piping assembly

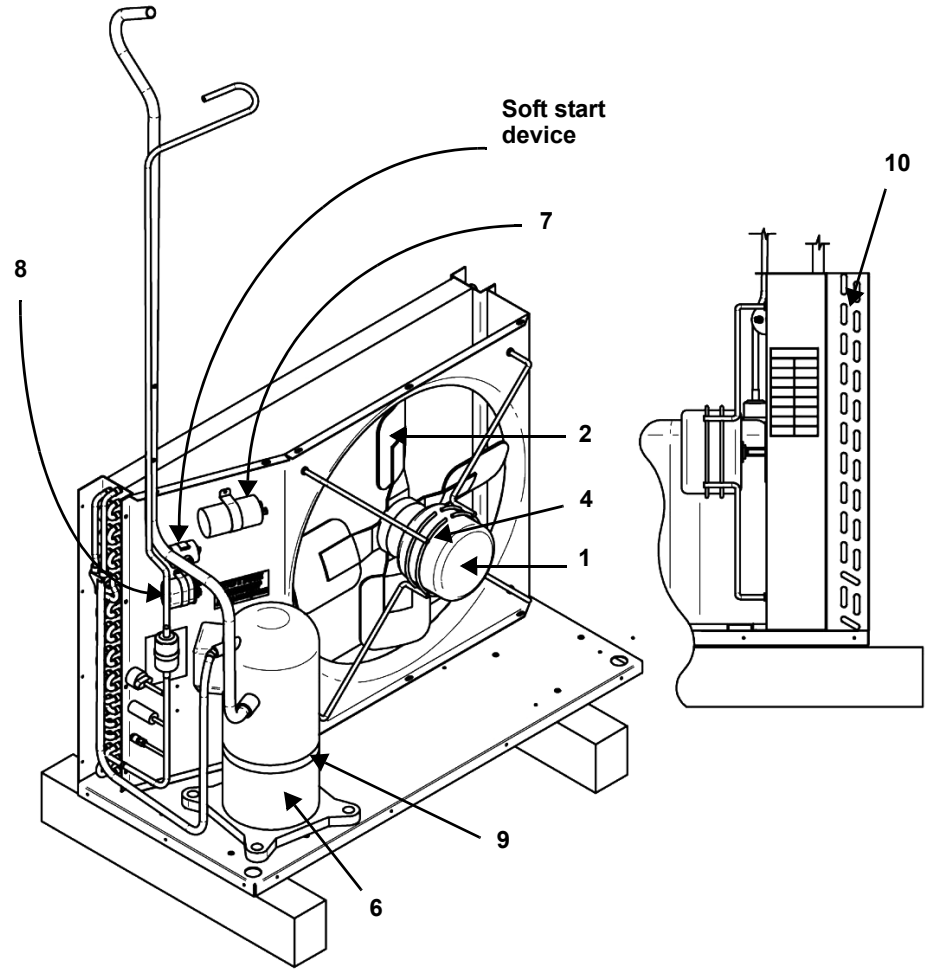


Figure 8 Evaporator blower

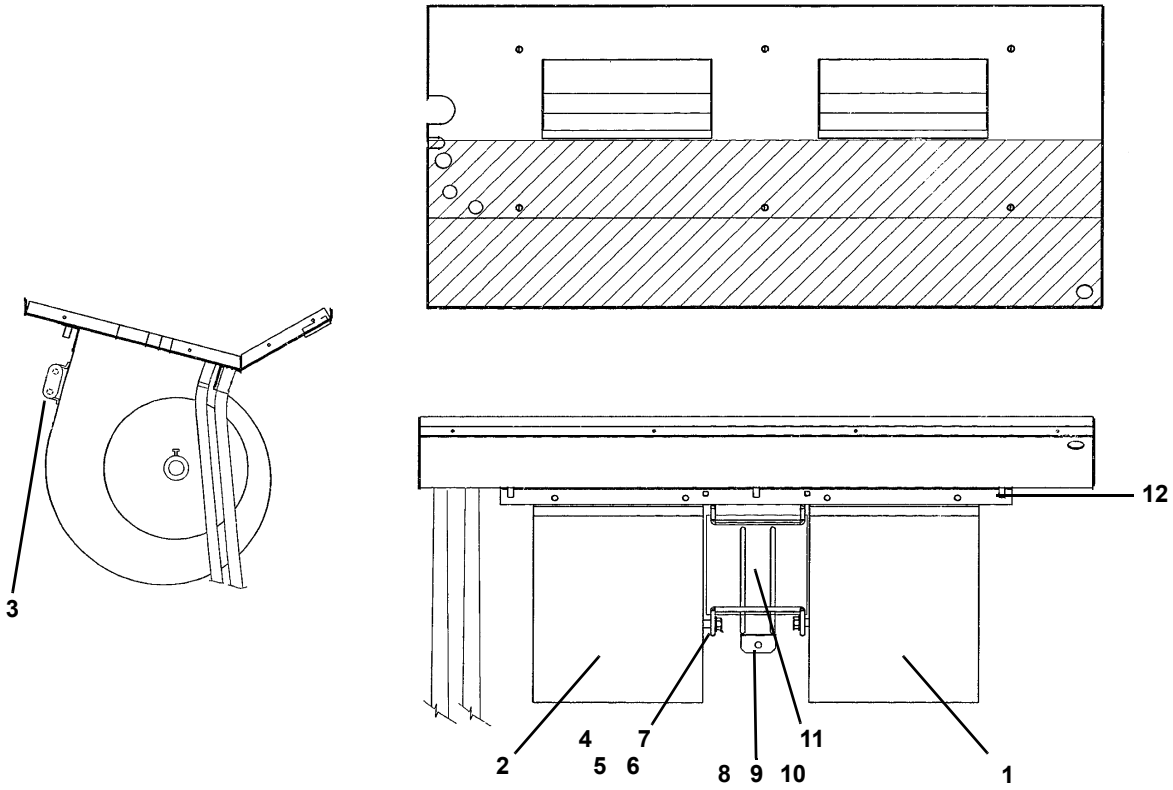


Figure 9 Evaporator coil and expansion valve

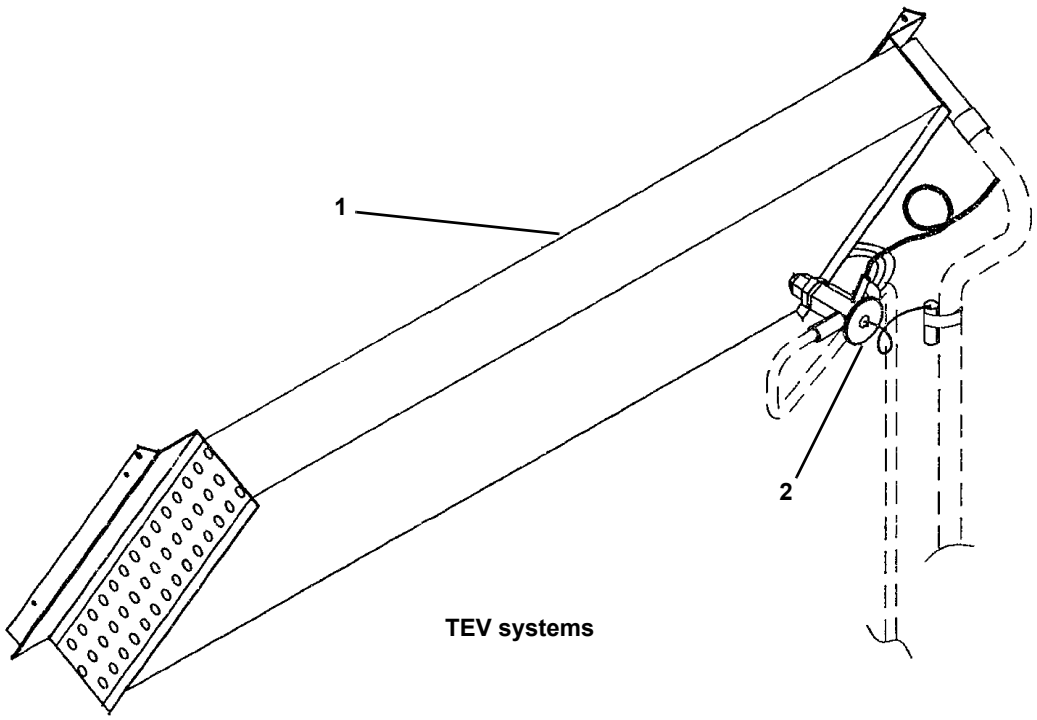
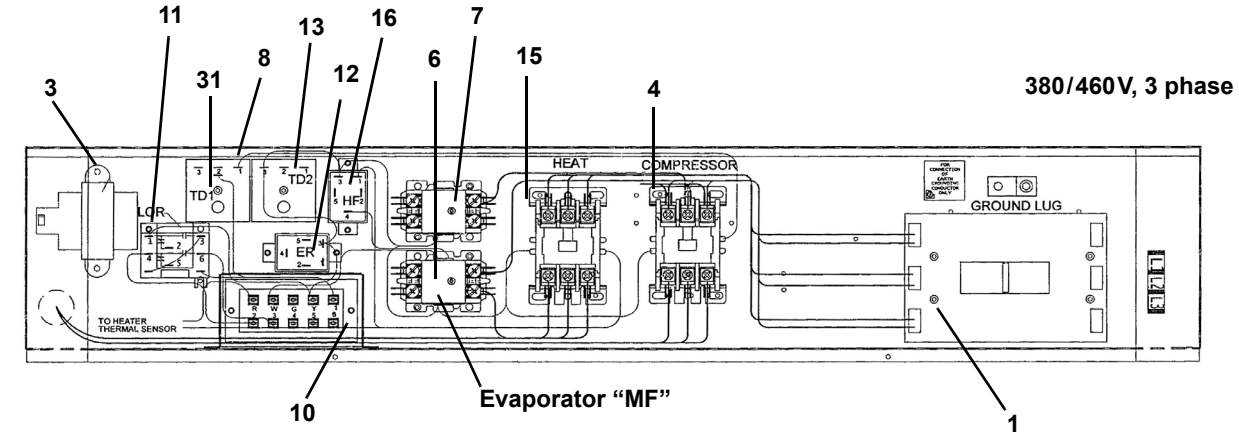
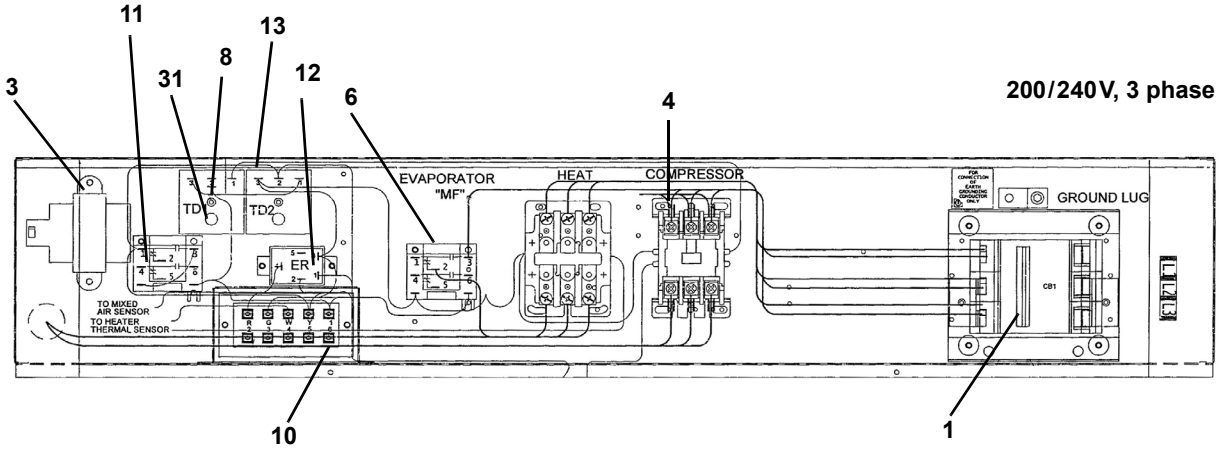


Figure 10 Electric panels





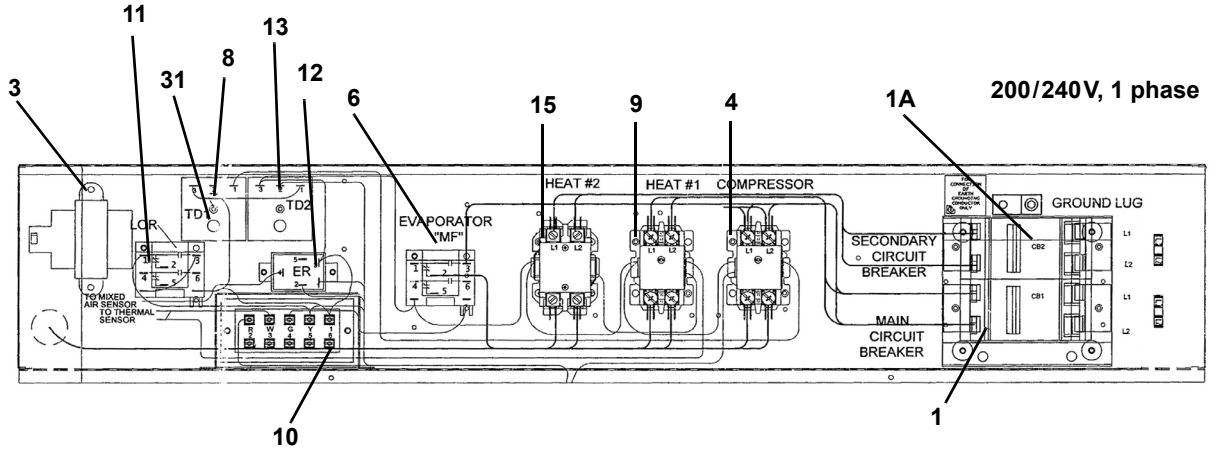
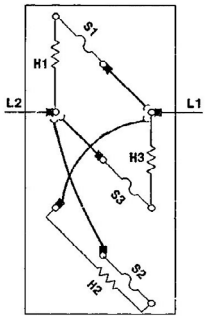
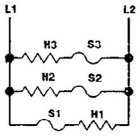


Figure 11 Heater assembly

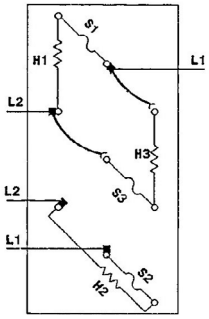
5kW &10kW 208/230V, 1 phase (Parallel) Connection



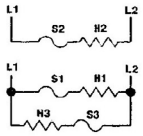
159171G1 & G2, G13 & G14



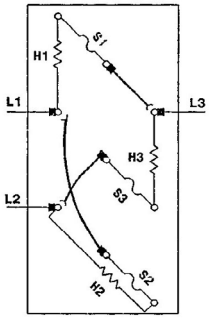
15kW 208/230V, 1 phase (Parallel) Connection



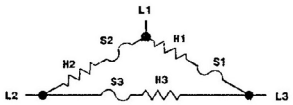
159171G3 & G15



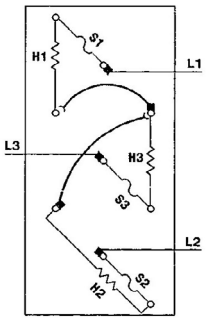
5kW, 10kW & 15kW 208/230V, 3 phase (Delta) Connection



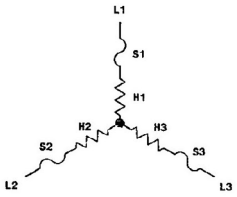
159171G4, G5 &G6 G16, G17 & G18



5kW, 10kW & 15kW 380/460V, 3 phase (Wye) Connection



159171G7, G8, G10, G11& G12 G19, G20, G21, G22, G23& G24



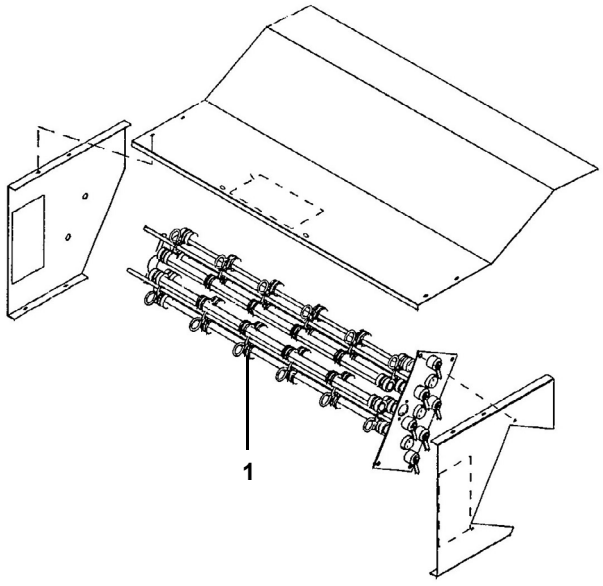


Figure 12 Economizer assembly

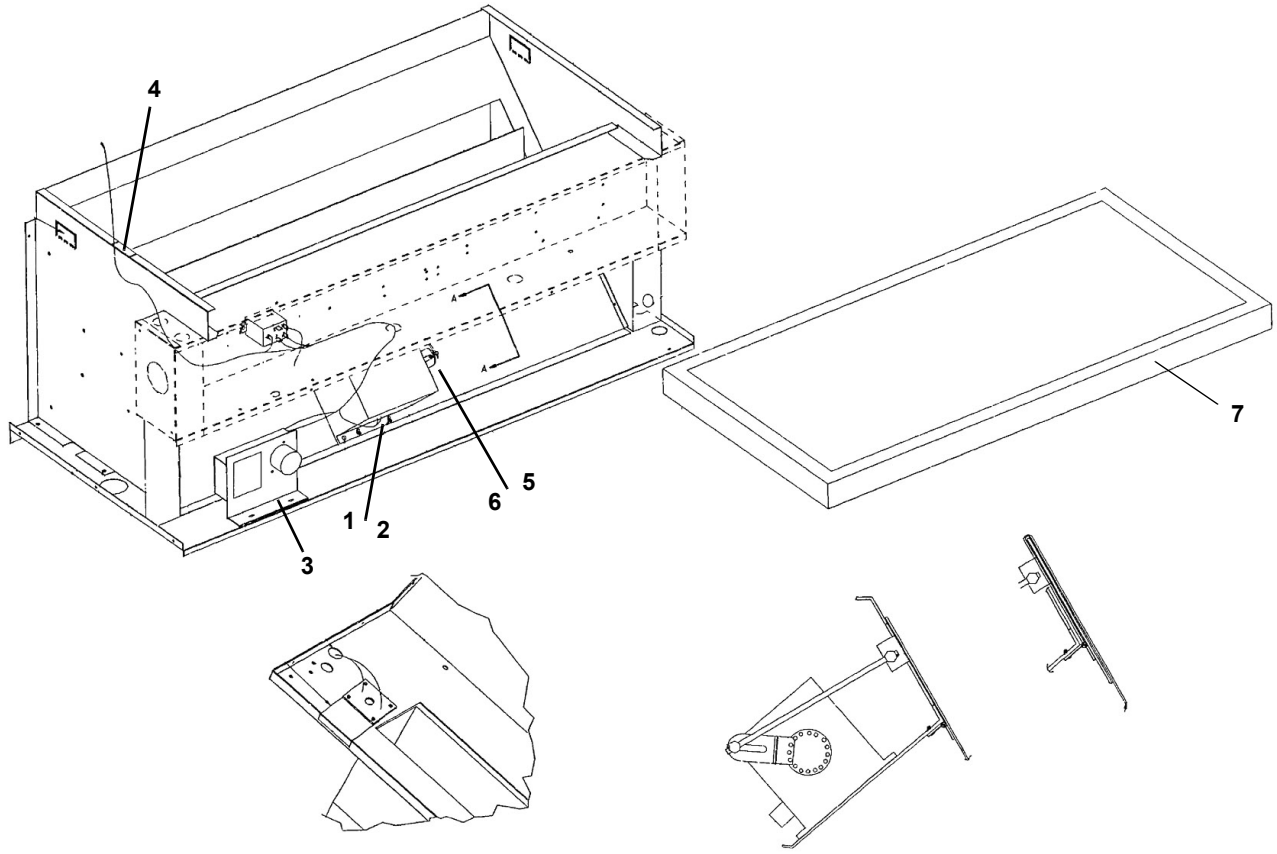


Figure 13 Common alarm assembly

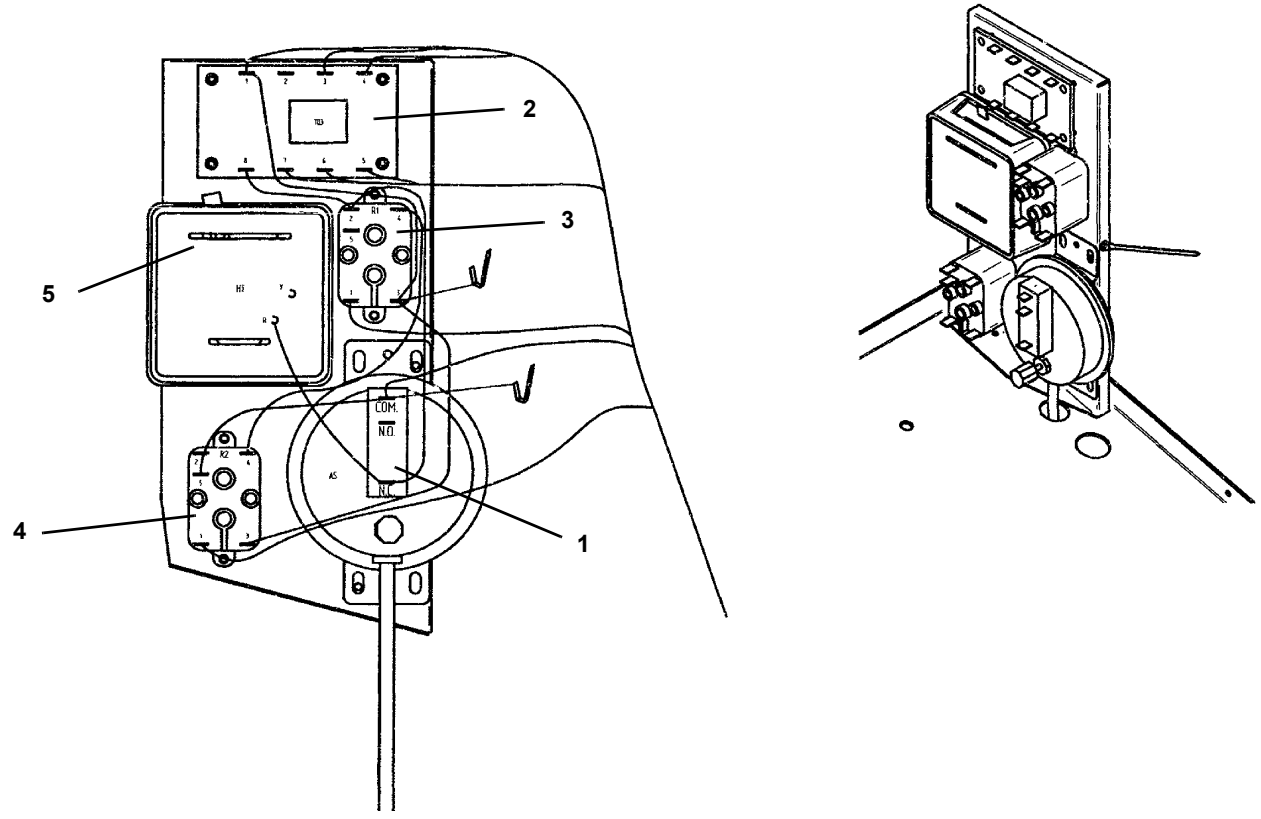
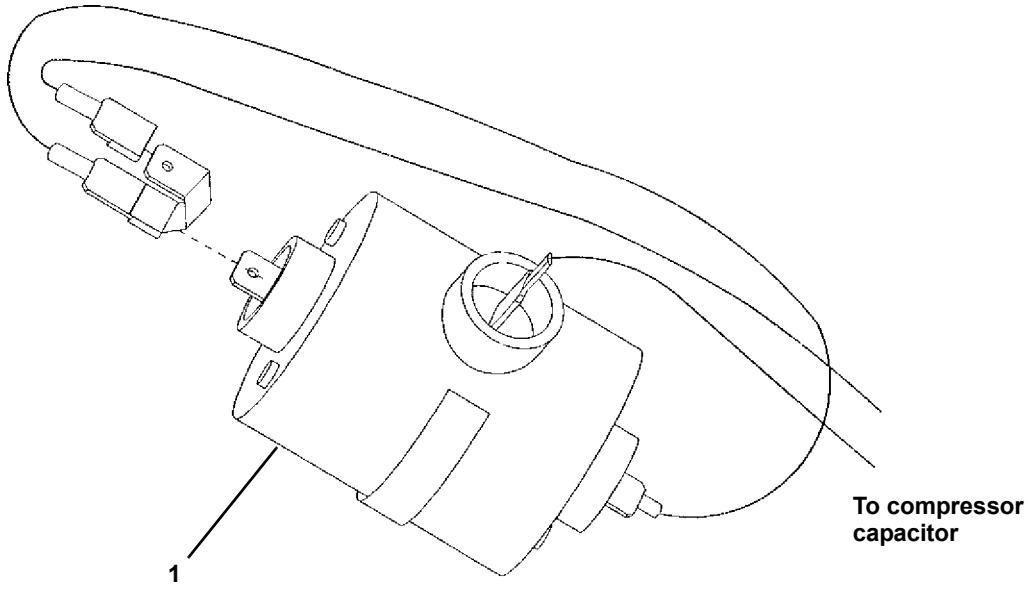


Figure 14 Soft start device



Technical Support / Service

Web Site
www.liebert.com

Monitoring
liebert.monitoring@emerson.com
800-222-5877
Outside North America: +00800 1155 4499

Single-Phase UPS & Server Cabinets
liebert.upstech@emerson.com
800-222-5877
Outside North America: +00800 1155 4499

Three-Phase UPS & Power Systems
800-543-2378
Outside North America: 614-841-6598

Environmental Systems
800-543-2778
Outside the United States: 614-888-0246

Locations

United States
1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229

Europe
Via Leonardo Da Vinci 8
Zona Industriale Tognana
35028 Piove Di Sacco (PD) Italy
+39 049 9719 111
Fax: +39 049 5841 257

Asia
29/F, The Orient Square Building
F. Ortigas Jr. Road, Ortigas Center
Pasig City 1605
Philippines
+63 2 687 6615
Fax: +63 2 730 9572

While every precaution has been taken to ensure the accuracy and completeness of this literature, Liebert Corporation assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.
© 2014 Liebert Corporation
All rights reserved throughout the world. Specifications subject to change without notice.
® Liebert is a registered trademark of Liebert Corporation.
All names referred to are trademarks or registered trademarks of their respective owners.

SL-19530_REV8_10-14

Emerson Network Power
Liebert
www.emerson.com